Dental Digest

November 1955

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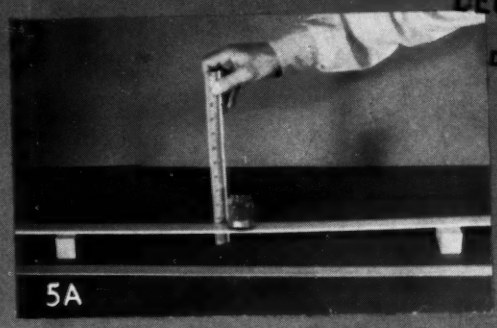
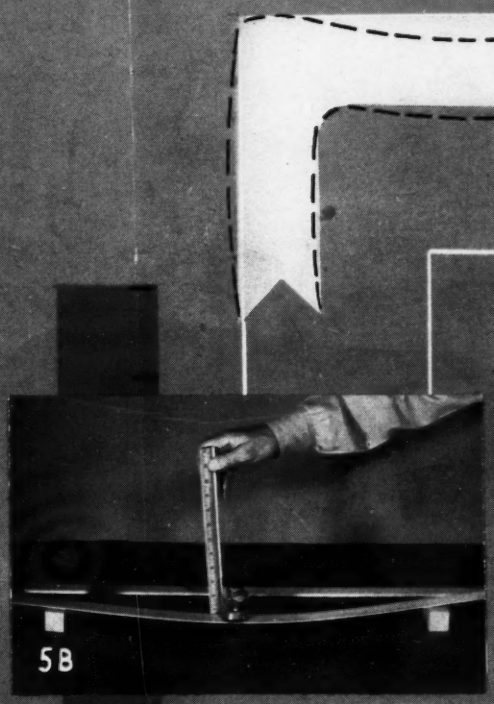
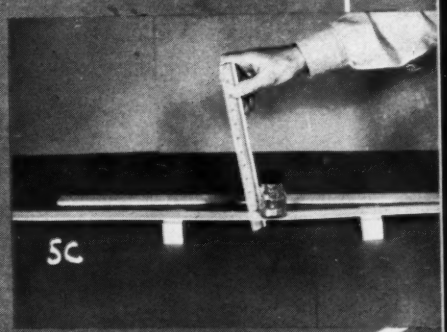






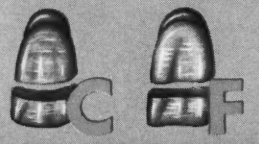
THE EASIEST, MOST ACCURATE PROCEDURE FOR TOOTH SELECTION

	36 MM	39 MM	40 MM	42 MM	43 MM	45 MM	46 MM	48 MM	51 MM
L LONG	L36 C	L39 C / L39 F		L42 C / L42 F		L45 C / L45 F		L48 C / L48 F	L51 C
M MEDIUM	M36 C	M39 C / M39 F	M40 C / M40 F	M42 C / M42 F	M43 C / M43 F	M45 C / M45 F	M46 C / M46 F	M48 C / M48 F	M51 C
S SHORT		S39 C / S39 F	S40 C / S40 F	S42 C / S42 F	S43 C / S43 F	S45 C / S45 F	S46 C / S46 F	S48 C / S48 F	
WIDTH OF 6s SET-UP	40.0 MM	44.0 MM	44.5 MM	47.0 MM	48.0 MM	50.0 MM	51.0 MM	54.0 MM	59.0 MM

The entire line of Five-Phase Anterior molds are arranged logically and identified *understandably* in the Co-ordinate Size Mold System as shown on this diagram. The actual width, length and labial character required for each case specifies the correct Five-Phase Anterior mold.

2 **The length of the upper anteriors is the measure of distance between the edge of the wax bite rim and high lip line.**

3 **Dominant labial character (Curved or Flat) may be obtained from pre-edentulous records or if none exists, the dominant labial characteristics of near blood-relatives will serve as a guide.**



Because of the co-ordinate size system and the co-acting proximals of Five-Phase Anteriors, you can quickly select any combination of flat or curved centrals, laterals and cuspids to create personalized dentures for your patients.

The proximals of Five-Phase Anteriors are co-acting. When required, you can therefore transpose teeth from different sets to personalize esthetics. The logical, orderly arrangement of the Co-ordinate Size Mold System simplifies the transposition procedure.

1 ***On the wax bite rim, inscribe the position of the central axis of each cuspid.***

One of the popular procedures followed for these guide lines is to place a straight edge at the alae of the nose and parallel to the central axis of the nose. This line continued to bite block will in 75% to 80% of general cases correspond to the central axes of cuspids.

A. The millimeter measurement taken between inscribed lines will correspond invariably to the numeral identification of the proper carded set of Five-Phase Anteriors.

FIVE-PHASE ANTERIORS

AVAILABLE IN ***YOUR CHOICE OF VERI-CHROME PORCELAIN AND VERIDENT PLASTIC***

MADE IN Veri chrome COLORS OF CONTROLLED BRILLIANCE

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DENTISTRY *Is* BIOPHYSICS – *Part One*

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DIGEST

Inlays, bridges, and partial dentures are beams. As such they all obey certain fundamental, long recognized engineering laws and principles which will be discussed in this article.

Much of operative and reconstructive dentistry engages physics. By beginning with certain fundamental concepts familiar from college physics and including some engineering data with which dentists may not be familiar, new concepts which have important bearing on everyday practice will be derived.

Basic Concepts

Two basic concepts are the following:

First Concept — "All bodies, however rigid or massive they may be, are deformed by the application of force." This is as basic as Newton's laws. It does not matter how small the forces may be, the deformations are necessarily present. Mastication gives rise to forces which produce deformations of compression, tension, shear, bending, elongation, and torsion of highly significant magnitude in the investing tissues, the teeth, and the restorations.

Second Concept—"Bodies stressed may be elastically deformed or permanently deformed." Substances differ all the way from extremely elastic bodies to those which have virtually no elasticity and are called plastic. If the object is deformed within its "elastic limit," when the force is removed the object returns to its original shape and length.

Other fundamental concepts in physics which have significance to restorative dentistry are the following:

Pressure—If one pushes down on a block of wood (Fig. 1) the block is resisting the push. If a force of 10 pounds is exerted, the block is pushing back with a force of 10 pounds because the forces are in *equilibrium*. If this were not true, the hand would push through the block, or if the block were pushing back with more force than that exerted upon it, it would push the hand away. "Pressure" by definition is the amount of the external force per square inch. In this case the pressure would be 2½ pounds because the block is two inches square.

Stress—The force within the block which is resisting the external force is "stress." As explained, it is always equal and opposite to the force exerted.

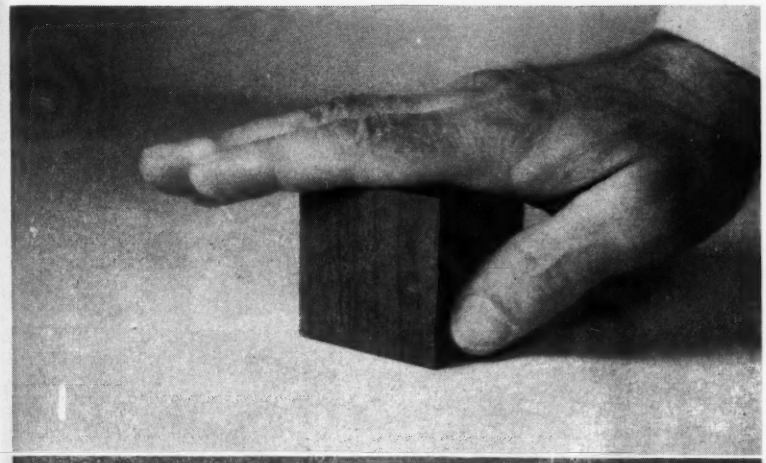
Strain—One other factor remains: the block is shortened during the test. If the block rebounds to its original length when the force is removed, it is elastically deformed and the amount of shortening per inch when the block is under load is its "strain."

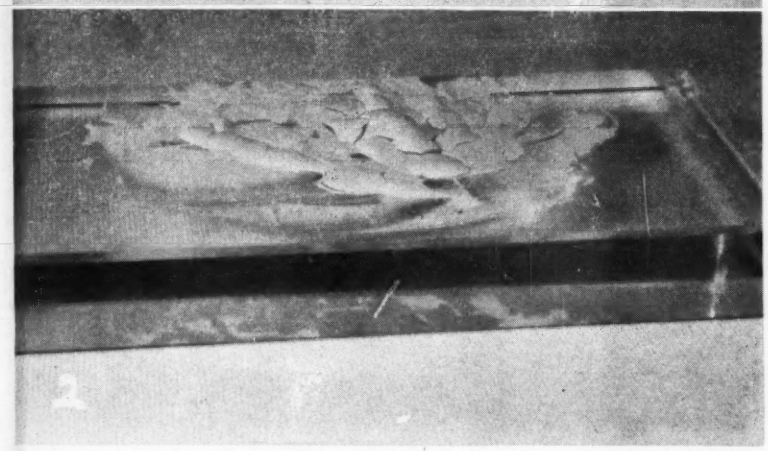
Modulus of Elasticity—This term is a mathematical abstraction which has importance because it *measures the stiffness of a material*, just as "feet" measure length, and "pounds" measure weight. Modulus of elasticity, or Young's Modulus, as it is sometimes called, is a ratio of stress to strain, and is usually written in handbooks of mechanics $E=\frac{S}{G}$. The ratio applies only within the elastic limit of a given specimen. Simply stated for the English system of units, the numerator of the fraction is the number of pounds per square inch which it takes to produce a given increase or decrease (depending upon whether the test is done in tension or compression) in the length of one cubic inch of specimen. The denominator is the amount of increase or decrease. If the force required to produce the deformation is great as in the case of steel, for example, the numerator (stress) will be a large while the denominator (strain) will be a relatively small figure.

High Modulus of Elasticity in Steel and Partial Denture Gold—When the arithmetic of dividing the large number by a small one is carried out, the quotient is a large figure—for steel, 30,000,000 pounds per square inch. When the numerator is a relatively small figure with respect to the denominator, as in the case of rubber, the resulting quotient is a low number. To the uninitiated, it may seem strange to say that steel and partial denture gold have high moduli of elasticity whereas rubber has a low modulus of elasticity.

Deformation of Teeth—Every time the jaws close and the teeth make contact, the teeth deform each other, the periodontal membrane, and the bone supporting them. The deformations of the teeth will take on characteristic patterns depending upon their shapes and the manner of application of the stress.

Factors Affecting Deformation of Teeth—If the teeth contain restorations they will deform differently to the same stresses because parts of the teeth have been cut away and the restorations have characteristic deformations to load of their own. If the





1. ***Cube in compressive stress.***
2. ***Set cement exhibits no adhesion. It peels right off the mixing slab.***

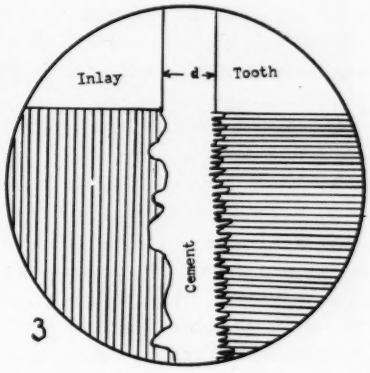
teeth serve as abutments for bridgework or partial dentures, the stresses and deformations will be different again because the abutments are supporting levers or beams and in each succeeding instance the deformations are more and more significant to maintaining health of the living tissues and keeping intact the physical properties of the structural materials.

Dental Cements

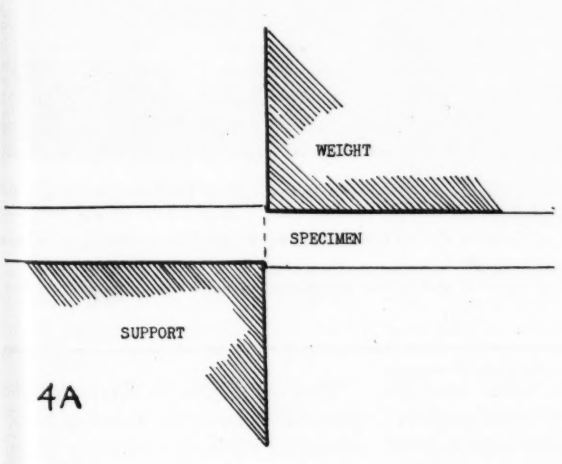
Dental cements are strong in compression but weak in tension. They have little adhesion. A hardened mix of cement peels right off the mixing slab (Fig. 2).

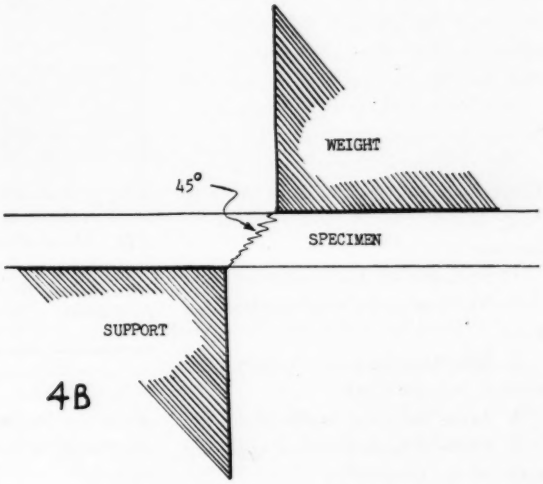
Inlays are retained by little "keys" or cement instrusions into dentinal tubulae or roughness of the tooth on one side and roughness of the inlay on the other (Fig. 3). It is the disintegration or shear of these keys that produce failure of the cement bond.

Shear—If a specimen which is brittle (like dental cement, porcelain, or structural cement) is placed on a block as shown in Figure 4A and a weight is placed upon the specimen directly over the edge of the supporting block, the specimen supports the weight. In elementary concept it is



3. ***Schematic illustration of the factors which maintain the dental bond.***
4A. ***Brittle specimen subjected to shear.***
4B. ***Brittle specimen in diagonal tension.***





the sum of cohesive forces of the molecules directly under the edge of the weight which is supporting the weight. If more and more weight is placed on the specimen, a critical value will be reached which will exceed the cohesive force of the molecules, they will slip past each other and the specimen will divide in two.

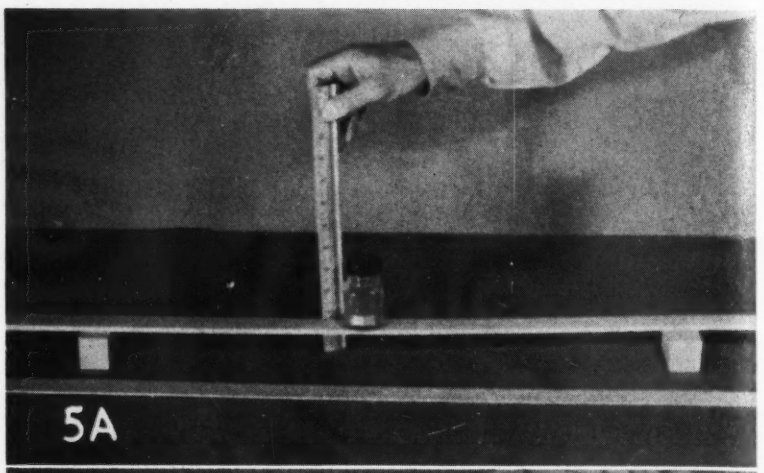
Diagonal Tension—If the test is repeated but the load is applied at a little distance from the support, for example, a distance such that a 45° angle is formed between the edge of weight application and the support, (Fig. 4B), the test may be called one of diagonal tension. Tensile stresses develop in the specimen when the weight is applied at some distance from the support and brittle specimens divide at much lower values. For example, the safe value for concrete in shear is 125 pounds per square inch, the safe value in diagonal tension across a 45° angle is 50 pounds.

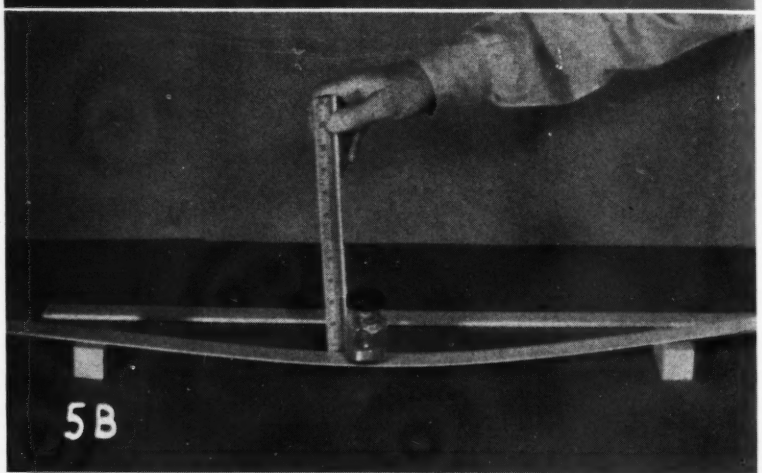
Other Properties of Brittle Materials — Although the average strength of concrete in compression is 3,000 pounds per square inch, the safe value is *600* pounds per square inch in compression, and *20* pounds per square inch in tension. Brittle materials are weak in *tensile* stress.

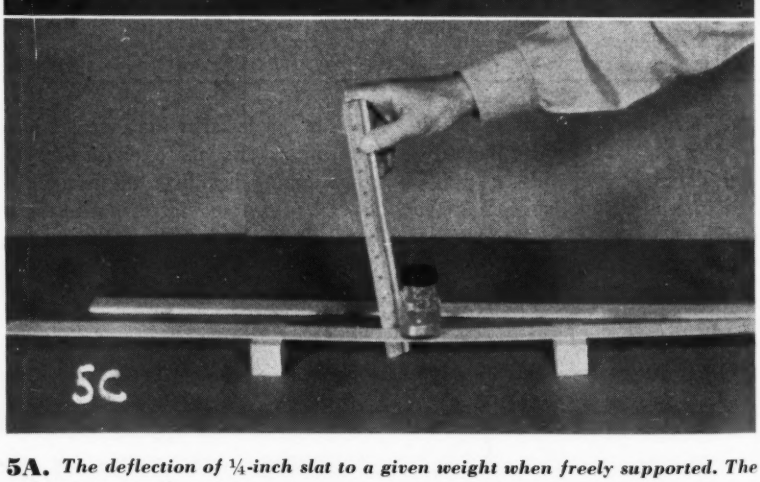
Strength of Keys in Shear—Since all dental cements shrink on setting and forces are applied to cement through torque, it is not known whether shear or the weaker quality (diagonal tension) of the cement is at stake when inlays or bridge abutments are improperly designed. Even in shear the strength of cement is much weaker than its strength in compression and it is only the *strength of the keys* in shear which has significance in the dental bond.

Determining Factors in Strength of Bond — The strength of the cement bond is determined by the following factors:

1. Strength of the cement in shear
2. Number and size of interlocking keys
3. Tolerance or space between the casting and the tooth
4. Areas involved in the bond
5. Pitch or taper between *opposing* walls of the preparation



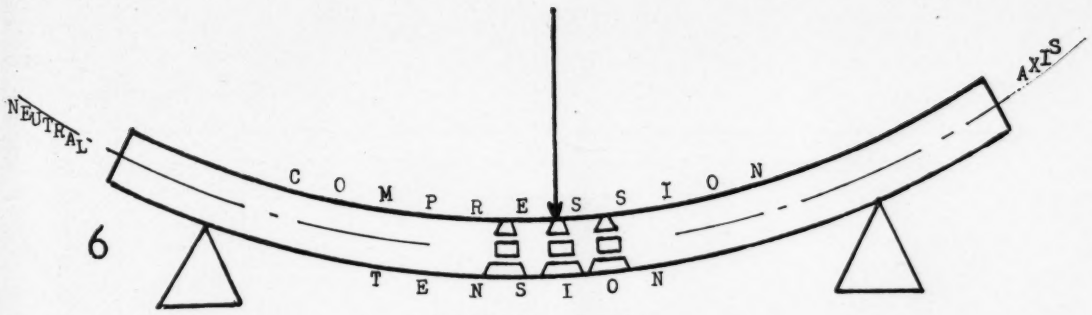




5A. ***The deflection of ¼-inch slat to a given weight when freely supported. The supports are two feet apart.***
5B. ***The deflection of ⅛-inch slat to the same weight with supports spaced two feet apart.***
5C. ***The deflection of ⅛-inch slat to the same weight with supports spaced one foot apart.***

6. Coupling. This takes into account the dovetail or other mechanical feature which takes advantage of torque.

Powerful Agents in Strength—The pin or dowel and the complete jacket exemplify perfection in cavity design for the cavity surface is continuously



6. *Stresses of bending.*

opposing. When such preparation is combined with little taper and the casting is made to close tolerance, the dentist marshals powerful agents.

Practical Significance—Two important conclusions are the result of this study:

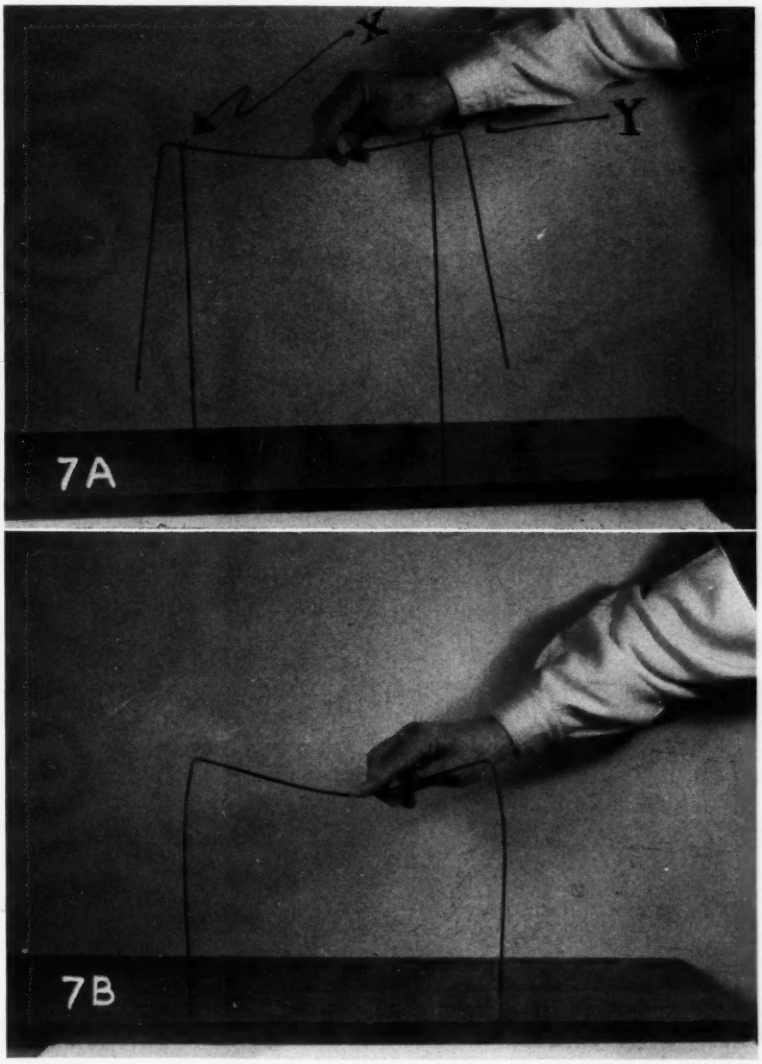
1. It should be regarded as axiomatic that the coupling between the abutment castings and the teeth should be such that the deflection and torsion set up in the prosthetic structure place the cement under the abutment castings in compressive stress. In other words cavity preparation should be such that there is a mechanical coupling between the inlay and the tooth. The operator must not depend upon cement to take the stress in shear or diagonal tension except in direct axial traction.

2. Prosthetic structures which subject the bond to great shear stress should be retained by rather large abutments such as the three-quarter or the full jacket crown.

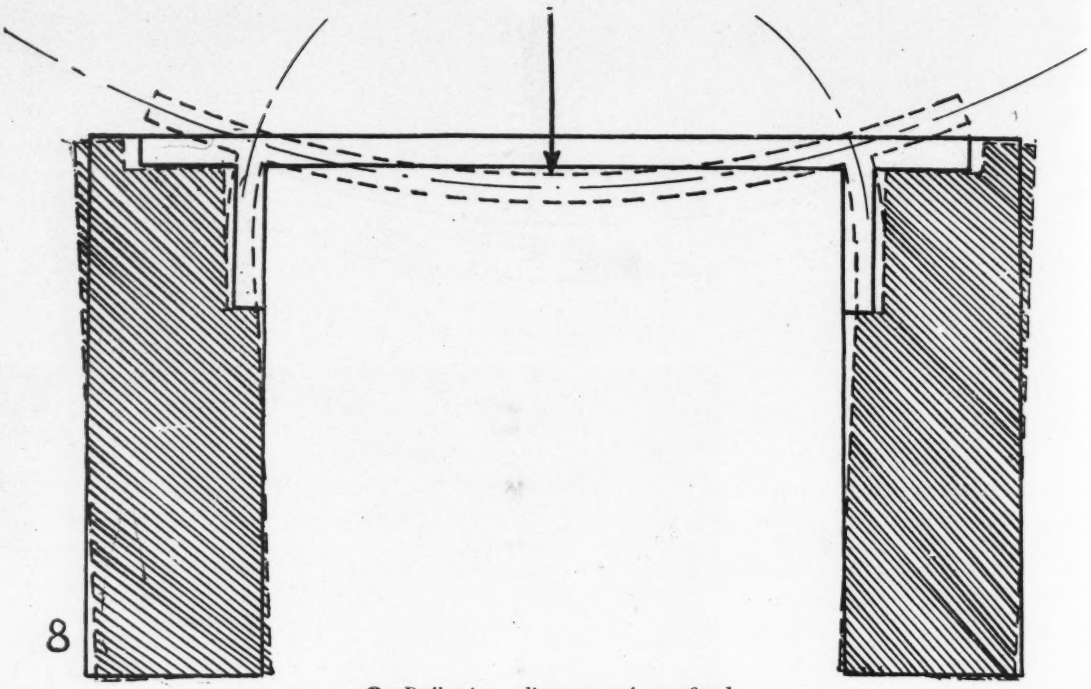
Deflection

A dental bridge is a beam between two supports or abutments like a plank across a creek or vehicular bridge across a river.

Deflection in a Beam—A plank or slat is the simplest form of beam. When freely supported and loaded with a weight as shown in Figure 5B, the slat bends and all the molecules which make up the upper half of the slat are compressed, all those in the lower half are stretched. Through the middle the molecules are neither compressed nor tensed, (Fig. 6) and engineers call this the neutral axis. The neutral axis remains the same length whether the beam is stressed or passive. The compressed side is shorter and the tensed side is longer when the beam is bent and the compression or tension is greatest in the outermost rows of molecules. "Deflection" is the amount of bending produced in a beam by a given load.



7A. *Typical deflection of U-shaped wire when freely supported at X and Y.*
7B. *Typical deflection of U-shaped wire when the vertical arms are restrained from lateral movement at the ends. The "columns" always bow outward.*



8. ***Deflection diagram of a fixed bridge with proximocclusal abutments.***

Variation in Deflection—Deflection varies as $\frac{1}{\text{depth}^3}$ and length^3. The slats shown in Figures 5A and 5B were cut off the same 2-inch by 4-inch lumber, 5A is ¼ inch thick and 5B, ⅛ inch. To a load the slat of Figure 5A bent a certain amount. To the same load the slat of Figure 5B bent 8 times as much. When the supports of the slat shown in Figure 5C are moved from 2 feet to 1 foot, the bending is ⅛ as much at 1 foot as it was at 2 feet. In other words the thin slat bent 8 times as much as the thick one (deflection varies as

$$\frac{1}{\text{depth}^3} = \frac{1}{(\frac{1}{2})^3} = 8)$$

and it bent 8 times as much at 2 feet as at 1 foot (length^3 = $(2)^3 = 8$).

Practical Significance — All other things being equal, from the formula (deflection varies inversely as the depth^3 and directly as the length^3) it is evident that:

1. A two-tooth bridge bends 8 times as much as a one-tooth span, and a three-tooth bridge 27 times as much.

2. The metal of bridges must be as thick from occlusal to cervical as possible to reduce bending.

Where Formula Applies—The formula applies to any material whose modulus of elasticity in tension equals or approaches that in compression so it includes anything springy, bone, dentin, steel, gold alloys, plastics, cardboard, wood. The only difference between these materials is that the higher its modulus the stiffer the material will be to bending. This quality of mass with respect to length and depth also carries over to the components of the inlay, that is, the proximal flange, isthmus, and dovetail.

Conditions of Freely Supported Beams—The removable bridge supported between two teeth fulfills the conditions of a freely supported beam. Cemented bridgework is attached to the foundation at one or both ends. The principles cited still apply to the cemented bridge with these differences: the supported cantilever bridge bends about ½ as much as a freely supported beam while a bridge fixed at both ends bends ¼ as much.[1]

Effects of Redistribution of Stress —But, although fixation reduces deflection in the beam, it does so through redistribution of stress and the redistribution puts *bending stress in the abutments.* Figure 7A shows a U-shaped piece of wire. When the horizontal part is freely supported and loaded the vertical ends move outward. When the vertical ends are restrained from free movement (Fig. 7B), loading of the horizontal part not only bends the beam but bends the supports as well *and these bow cutward.*

Bridge Physics

Dental Physiology — To eccentric or horizontal loads, a single rooted tooth turns on an axis of rotation which is located in the apical third of the root of the tooth (Fig. 19A). Multirooted teeth also turn on axes in this region but if the horizontal force is across the roots, the axis of rotation lies in the bone septum between the roots of the teeth, (Fig. 19B) and a certain amount of translation of the roots occurs.

Bridge Dynamics—Engineers frequently make models of cardboard, wood or other materials if they are studying unfamiliar problems. If models are made of teeth and bridges in cardboard and the teeth are pinned to a drawing board so they can turn on axes of rotation as teeth do in sockets the following facts will be learned (disregard cement for the present analysis just as masonry is

disregarded by engineers in the stress analysis of steel-framed buildings):

1. The bridge always bends in a characteristic manner (Figs. 8, 9, and 10A).

2. The teeth move very little, most of the movement is in the bridge structure.

3. The proximal flanges bow. The surface nearest the pontic is in compression; the surface toward the tooth, in tension (Fig. 8).

4. The isthmuses and dovetails are raised out of their seats (Fig. 10A).

5. Only the cervical floors of the abutment inlays are in direct compression.

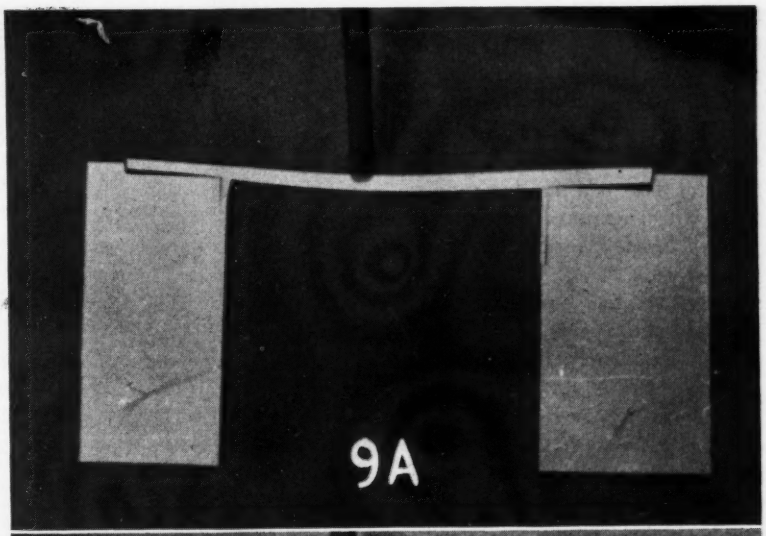
6. The opposite flange of an MOD moves away from the abutment tooth and not toward it (Fig. 9B).

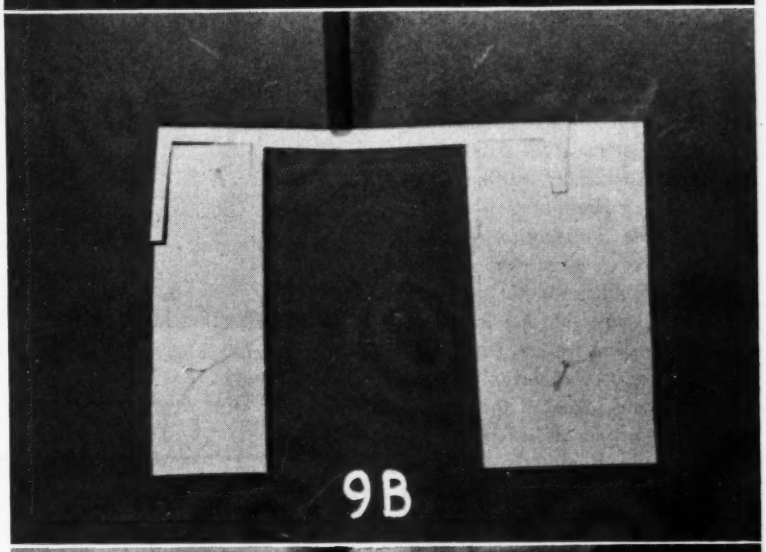
7. The abutment with a dowel stays down even without cement (Fig. 9B).

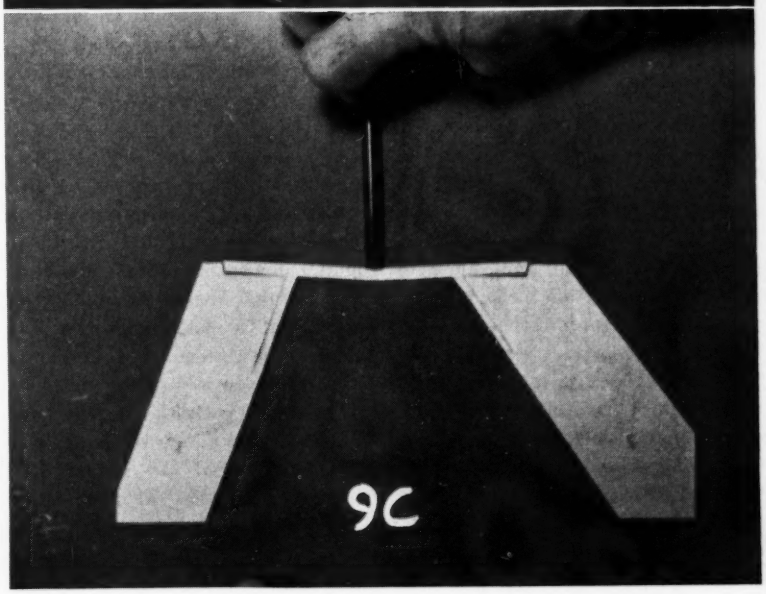
8. The deflection occurs whether the load is concentrated or uniform over the entire span of the structure. The only difference is that the deflection to uniform load is about ½ that to concentrated loading.

Axiom for a Design Violated—Figure 10A is a wooden model of a bridge. The analogues of the teeth are free to turn on axes at X. The abutment teeth are thrust apart by the loading. The cement under the pulpal surface of the isthmuses and dovetail would be in tension (if tension were possible) and the cement along the axial surfaces would be in shear. This violates the axiom for bridge design.

To Prevent Rising of the Dovetail—Figure 10B shows that a dowel will prevent rising of the dovetail. A better way to keep the dovetail from rising, physiologically as well as mechanically, is to cut a shallow MOD and unite the distal to the mesial







9A. ***Cardboard model illustrating bridge deflection when abutments with thin flanges are used (pinledge, thin proximocclusals).***

9B. ***Cardboard model showing deflection of MOD type of abutment and immobilization produced by dowel at right.***

9C. ***Cardboard model showing deflection of bridge when supported on tipped abutments.***

flange with a strap of metal. Metals take stress in tension well. The strap prevents the opposite flange from rising, stiffens the proximal flange and puts the cement here under compression. The three-quarter crown in *posterior* teeth is a thin but rigid retainer with augmented bond.

Fixed Bridge Desirable Physiologically—Figure 11A shows that where the abutments are strong enough to withstand the severe racking due to fixation, the fixed bridge is extremely stable and is desirable physiologically. With fixation the deflection of the pontic is reduced, the abutment teeth have considerable mass and are further stiffened by alveolar bone. Vertical loading is transmitted to the periodontium as vertical loading to the greatest degree. This is desirable because it puts the periodontium and bone in tension, the best possible way to load these tissues. The fixed bridge also takes horizontal loading better than any other prosthesis.

Undesirable Foundation Features in Cantilever Construction — Figure 11B and 11C illustrate that supported cantilever construction has less desirable foundational features:

(1) In negative occlusion the primary abutment takes all the load.

(2) In positive occlusion, due to the eccentric loading on the secondary abutment, the primary abutment again takes more than its share of the load.

(3) The loose coupling racks the teeth in the sockets more than fixation at both abutments but spares strain on the abutments so smaller abutment castings may be used.

Racking in the sockets is not desirable if the abutment teeth are loosened or if chronic infectious processes exist about the abutment teeth as the pumping action incident to the use of the bridge exacerbates the infectious process.

Practical Significance—(1) Bridges must be thick from occlusal to cervical so they will be stiff and not rack the abutment castings.

(2) The abutment castings must be stiff so they will not twist readily and crush the cement under them.

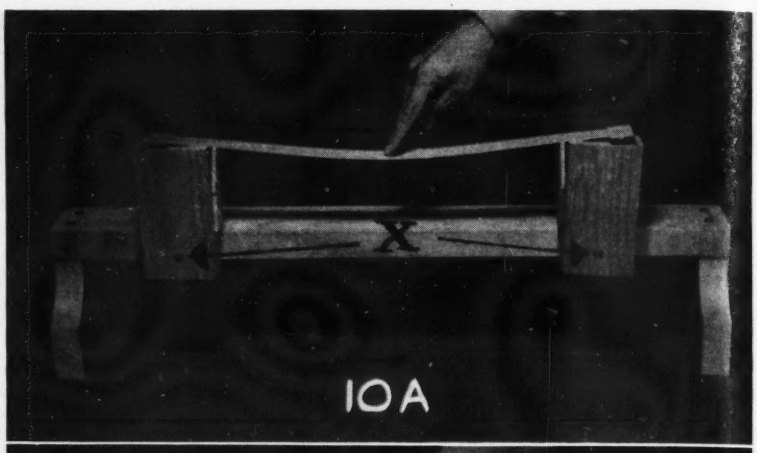
If they are supporting posterior fixed bridges or precision partials, pin-ledges, and three-quarter crown preparations on cuspids are likely to give trouble for two reasons:

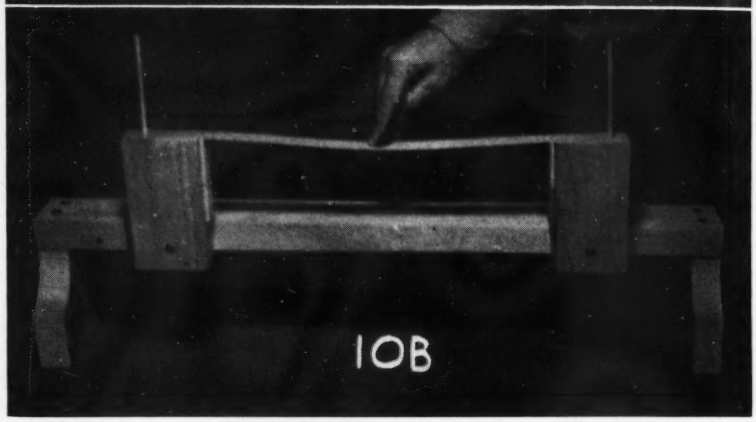
1. Articulation across the cuspid is heavy so the casting is likely to be thin.

2. The cuspid and anterior teeth present only *three* surfaces for preparing the three-quarter instead of *four* as in posterior teeth. A three-quarter in a cuspid is more closely related to the MOD than the three-quarter of a posterior tooth. For adequate retention on a cuspid, a veneered jacket seems to be indicated.

Individual Inlays—The "B" gold alloys have a modulus of elasticity of 13,000,000 pounds per square inch. Human dentin has a modulus of 1,600,000 pounds per square inch. The modulus of enamel is not known but presumed to be somewhat higher than dentin. Since dentin is a fairly yielding body and rendered still more yielding in the central portion of the tooth by the presence of the pulp chamber, proximocclusal restorations bend into the tooth upon loading (Fig. 12A). The proximal portion of the restoration is better supported because there is no pulp chamber under its floor. The MOD bends as shown in Figure 12B, and it can be seen that the MOD, the fixed bridge, the bent U wire, and the vehicular bridge are all related structures.

Strength of Section — Since tooth structure and inlay golds are extremely resilient substances, undoubtedly the deformation of tooth and restoration material is well within the elastic limit of these substances even when put to heavy usage and over a long period of time. If the filling material has a small elastic range, like





10A. ***Wooden model illustrating deflection of a fixed bridge with proximocclusal abutments. The analogues of teeth are free to turn on axes at X.***
10B. ***The same model as Figure A but demonstrating efficacy of vertical dowels.***

amalgam, it may fatigue and fracture where the cantilever adjoins the support. This occurrence may be prevented if it is known that the strength of a given section varies directly as the square of the depth. The engineering formula for computing stress in a cantilever beam is $\frac{M}{S} = \frac{\text{bending moment}}{\text{section modulus}} = \frac{wl}{8} \cdot \frac{bd^2}{6}$ and that in a fixed beam is $\frac{M}{S} = \frac{wl}{8} \cdot \frac{bd^2}{6}$.

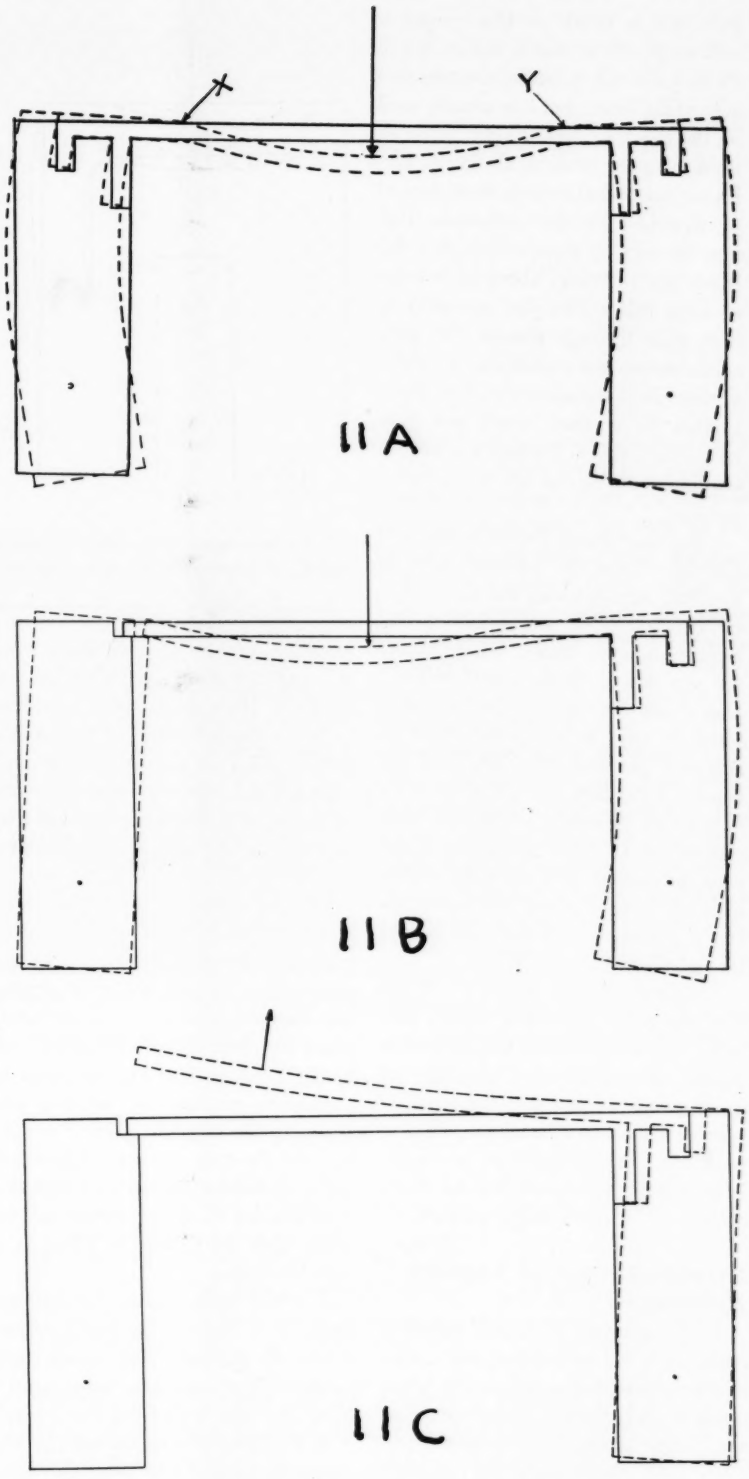
Increasing Strength of Beam — It can be seen that all the terms are of the first power except "d" which denotes depth. Doubling the *depth* of the beam makes it *four* times as strong. Making the beam twice as wide only makes it twice as strong. It is wrong to assume that values can be inserted in these formulas to compute stresses in restorations for the formulas apply only when the beam is unsupported except at the abutment.

Deep Joint in Bridgework Desirable—Strength of section has special significance to the soldered joint of bridges for here the structure is necked down and solders are weak alloys of gold. The soldered joint of bridgework should always be made as deep occlusogingivally as anatomic conditions permit.

Function of Cubed Power—While strength of section is a function of a squared power of depth, prosthetic structures do not fail so frequently from fracture of a section as from loosening of the abutment castings or the teeth themselves. The racking and twisting of prosthetic structures when in use involve bending, and as it has been shown, deflection is a function of a cubed power of depth and length.

Why Do Pontics Break? — The bridge has been studied as if it were of uniform section and homogeneous material. Dental bridges usually are not like this. Nevertheless, the principles discussed still apply. Bridges of gold alloy and porcelain (modulus of elasticity 16,000,000 to 45,000,000 pounds per square inch^2) will be much stiffer than bridges of gold alloy and plastic (modulus of elasticity 400,000).[3]

Porcelain Takes Limited Amount of Tension—In addition to being stiff,



11A. ***Schematic deflection diagram illustrating the effect of concentrated vertical loading on a fixed bridge. Contraflexure occurs at X and Y.***

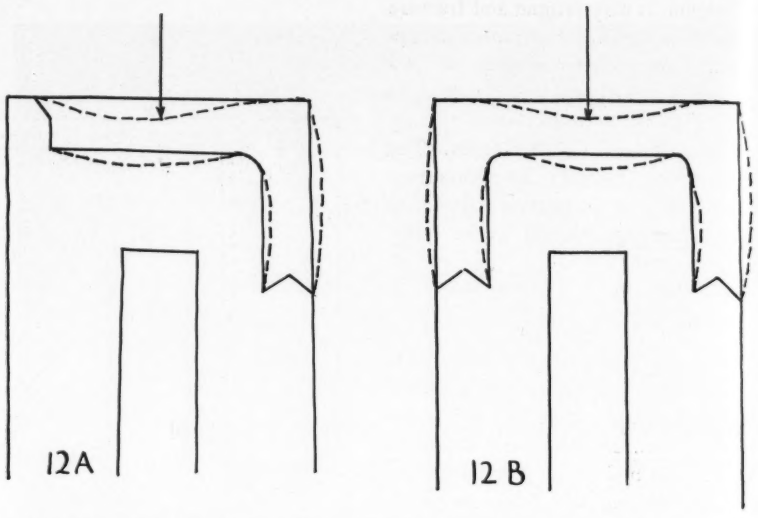
11B. ***Schematic deflection diagram of "stress-broken" or supported cantilever bridge in "positive" occlusion.***

11C. ***Schematic deflection diagram of supported cantilever bridge in "negative" occlusion.***

porcelain is brittle so like cement it will do poorly in tensile stress. It will do best when it is on the compression side of the beam, but it is usually used on the tissue or tensile side. When so used in upper bridges, the gold overlaying the buccal cusp is often peened or stretched by the occlusion. This may be seen by examination as a flat shiny spot or track. The gold is longer when this occurs just as surely as if it went through rollers. The porcelain resists the stretching; its outer surface is in compression, the inner surface in tension. Since porcelain will only take a limited amount of tension, it breaks at the point of retention.

Concentration of Force in Areas of Contact—Even the hardest gold alloys will stretch under the above dental conditions of use unless special precautions are taken. Since *points* on the lower teeth meet inclined planes on the uppers in "working bite," if only a few points meet in eccentric position they bear the full brunt of the bite and since the area of contact is small, prodigious concentrations of force take place in the areas of contact. For example, a phonograph arm weighing one ounce exerts a pressure of 10 *tons* per square inch at the needle point.[4]

Practical Significance — When bridgework or much restorative dentistry is contemplated, the occlusion should be equilibrated so that as many cusps as possible are used to take occlusal force in all mandibular positions. Equilibrium of occlusion is important, therefore, for *mechanical* as well as physiologic reasons.



12A. ***Schematic deflection diagram of proximocclusal restoration.***
12B. ***Schematic deflection diagram of MOD restoration.***

Establishment of Logical Procedure

1. If accurate hydrocolloid-taken study casts are articulated and critically examined for a sufficiently large number of patients, a large percentage (some authorities state 50 per cent) will show areas of occlusal abrasion which do not come into contact in the patient's voluntary masticatory movements. These abraded areas can only be explained by transitional contact of the abraded surfaces during certain involuntary excursions of the mandible in chewing. All patients exhibiting this kind of abrasion have retrudable mandibles.

2. Standing in front of the patient, gently grasp the point of the patient's chin and ask him to let you assist him in closing his jaw. State, "Do not try to close in 'home' position. Just ever so lightly, let your teeth touch." While the patient opens and closes slowly a number of times, gently direct the jaw backwards. Some patients relax so completely to suggestion that the dentist can immediately place the jaw in its completely retruded position and tap the cusps of premature contact by raising and lowering the mandible. Other persons are not so responsive to suggestion, but with encouragement and repeated trial a point of distal contact will be made. Ask the patient to point to it with his finger.

3. Place carbon paper between the teeth, and repeat the performance. Advise the patient, "Just barely make contact. Now tap, tap, very lightly. Now close the rest of the way down."

4. Examine the markings in the places the patient will point out. Usually these will appear on inclined surfaces. Reduce the inclined surfaces until all teeth meet solidly in the retruded position. No vertical closure will result.

5. Adjust right "working bite" according to the advice of Clyde H. Schuyler, E. R. Romine, Charles H. M. Williams, until as many teeth make contact in right lateral as possible without defacement of the teeth. Usually the reverse is true. The teeth look better after the adjustments. The upper cuspids and first bicuspids are the teeth most frequently in need of considerable reduction as well as the inner inclines of the buccal cusps of the lower left third, second, and first molars. When this is done, it is amazing how many teeth will share the occlusion in "working" and "balancing" bite. Often all the molars and bicuspids of the opposite side will come into occlusion in balancing bite after the adjustments are made whereas this is rarely the case with the average unground occlusion.

6. Repeat the adjustments for left working bite relations.

7. Finally, adjust for best possible incisive relation.

8. This order of procedure will not provide balance equal to that achieved by occlusal reconstruction attained

(*Continued on page* 517)

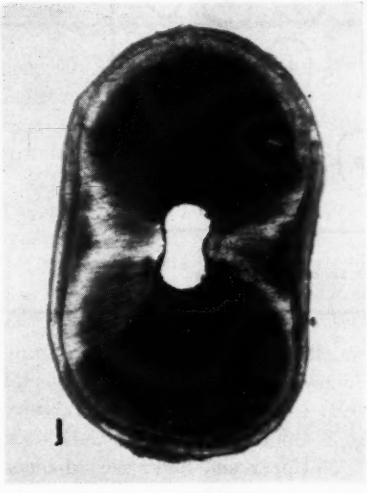
[1]Best, Fred: Structural Engineer for Western Electric Company. Personal communication.
[2]Decker, A. R.: Research Investigation for Champion Spark Plug Company. Personal communication.
[3]Skinner, E. W.: Science of Dental Materials, Philadelphia, W. B. Saunders Company, 1944, p. 87.
[4]Reiskind, H. I.: Engineering Report from RCA Victor Phonograph Record Department. Personal communication.

The Use of MORPHO-ANATOMIC INSTRUMENTS *in Endodontia*

PALMIRO FERRANTI, C.D., and JAIME RADESCA, C.D., Brazil

DIGEST

Endodontists agree that the success of treatment of infected pulpless teeth is in direct relation to the surgery practiced in the root canal, chiefly the apical third. One authority has stated: "Surgery is armed therapeutics." It is believed that if root canals were properly opened, enlarged and irrigated, good results would be obtained in 75 per cent of cases by these means alone. The greatest care should therefore be devoted to surgery of the root canal since it is the most important phase of treatment and will determine the success or failure of the case. This article reports a study of the inner topography of teeth which in many cases is ellipsoid rather than cylindrical and suggests that the use of instruments in root canal surgery which conformed to the shape of the root canal would be extremely valuable to practicing endodontists.



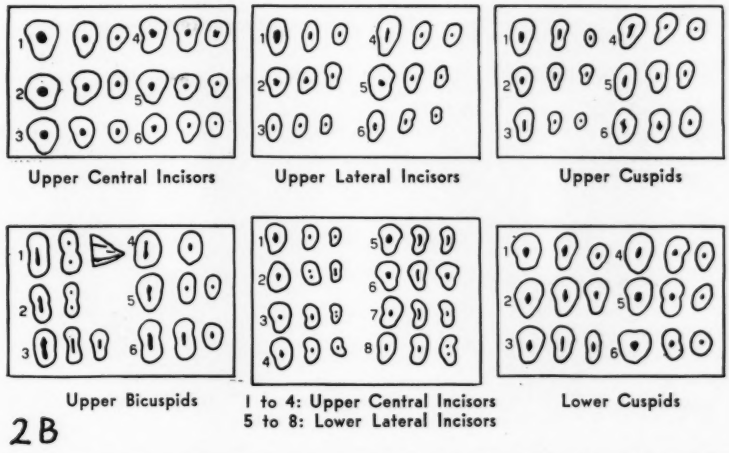
1. *Upper lateral incisor.*

Study of Inner Topography of Teeth

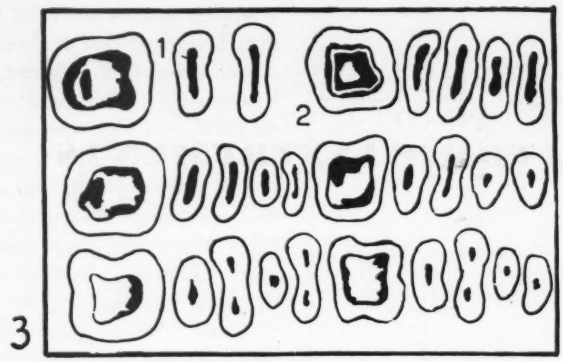
The sectioning of teeth, both longitudinally and in cross-section, would be profitable measures for all dentists. Such sections can readily be made with a diamond or carborundum disc to expose to view the inner topography of the teeth for more direct study.

Some Root Canals Ellipsoid in Shape—In 1949 Radesca called attention to the fact that the root canals

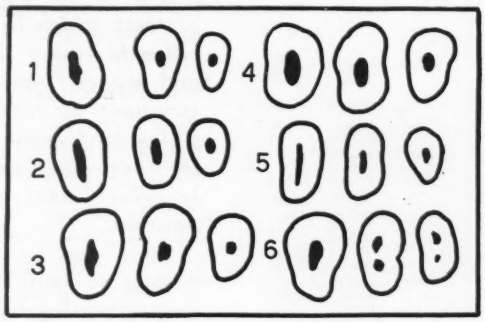
2A. *Lower central incisor.*



2B. *Transverse sections of root canals. (From Pucci and Reig)*



3. *First and second group of lower first molar.*



4B. 1, 2, 3: *first bicuspids.* 4, 5, 6: *lower second bicuspids.*

4A. *Lower lateral incisor.*

of various teeth are ellipsoid in form and suggested the use of ellipsoid instruments for use in such canals. If the topography of root canals is examined, a large number of variations in the morphoanatomic conformation of the root canals will be found with an elliptic form predominating in the following groups of teeth:

1. Upper and lower incisors
2. Upper and lower cuspids
3. Upper and lower second bicuspids
4. The distal roots of lower molars

Available Instruments Cylindrical in Shape—It is surprising that the only root canal instruments available (reamers, files, and rattail files) are all cylindrical in shape.

Advantages of Morpho-Anatomic Instruments

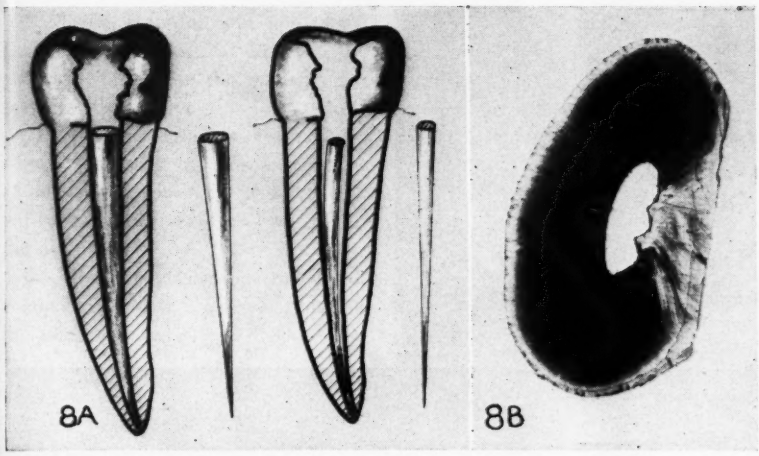
Instruments conforming to the shape of the root canals would be a boon to practicing endodontists. These instruments would have the following advantages:

(1) Twice as much flexibility on two sides enabling the instrument to

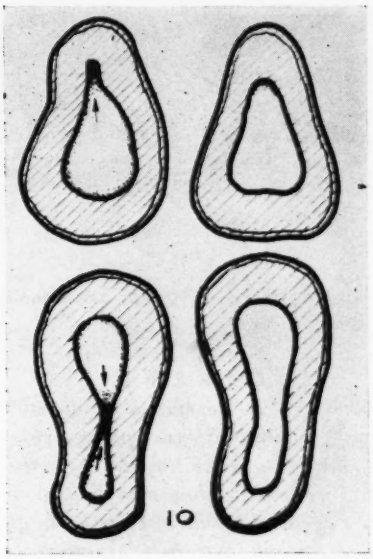
5. *Upper second bicuspid.*

6. *Upper cuspid.*

7. *Lower cuspid.*



8A. ***Elliptic gutta-percha cones facilitate the proper filling of canal.***
8B. ***Distal root of first molar.***



10. ***Diagrammatic view of root canals showing ellipsoid shape.***

9. ***Lower second bicuspid.***

penetrate into the canal more readily. Generally the curvature of the root canal assists the flexibility of the instrument.

(2) An ellipsoid instrument would be as strong as cylindrical instruments in use at present.

(3) An ellipsoid instrument would not revolve in the root canal because of its shape. However, since this movement is one of the causes of breakage, and since the instrument would work by pressure and traction, there should be less possibility of breakage.

(4) As an ellipsoid instrument conforms to the topography of the canal, movement within the canal should be easier.

(5) As the surface area of the ellipsoid instrument is greater than that of a cylindrical instrument, it should cut faster.

Gutta-percha and silver cones should also be available to conform to ellipsoid files.

Praca Roque Fiori, 26
Sao Joao da Boa Vista—S.P.

Behçet's Syndrome

Conclusions

Behçet's syndrome, of recurrent genital and oral ulceration with eye lesions, presents many difficult clinical problems. The pain of the lesions may be incapacitating; total blindness may develop, and death has resulted. The picture is complicated by confused terminology, and it seems unfortunate that emphasis has been laid on the "triple" nature of the syndrome, because this tends to preclude the diagnosis in cases with only two of the three main features, and obscures the possibility of additional lesions (joints, cerebral, skin).

The diagnosis must sometimes be missed through the patient's receiving only a specialized examination from the ophthalmologist, dermatologist, dental surgeon, or gynecologist.

The etiology is still obscure, but it seems possible that it, and the related syndromes, may eventually fall into place among the collagen diseases.

Treatment and its assessment are difficult. The treatment of four patients with cortisone and corticotrophin has led to unusually long periods of remission, and exacerbations, when they have occurred, have been notably diminished in severity. The correct policy to adopt regarding these drugs is not yet clear.

Adapted from *Lancet* **6868**:370 (Feb. 19) 1955.

Alginate LIFE MASK

WILMER B. EAMES, D.D.S., Glenwood Springs, Colorado

DIGEST

This article describes a method for securing an exact plaster replica of the lower half of the face before extractions and dentures are made. This model can be kept to be used later in making dentures restoring facial contours. Study models of the teeth before extractions with the relaxed lip line marked on the model are also valuable. The entire procedure takes about thirty minutes and can be completed while impressions are being made for immediate dentures.

Procedure

The face is outlined with one or two rolled wet towels to keep the material confined. No lubricant is needed on the face as alginate is easily removed.

Preliminary Steps—1. Insert one large diameter drinking straw about two inches long in each nostril (Fig. 1).

2. Assure the patient that he can adequately breathe through the straws if he can breathe through his nose. It may be necessary to use nose drops to facilitate breathing. Also tell the patient that in an emergency he can quickly remove the straws.

3. Have the patient close his teeth in centric relation and relax all the muscles of the face.

Preparing the Material—Mix four to six portions of alginate in a large bowl. Mix the alginate colder (about 60°, and thinner) with more water than is ordinarily used. This will give ample time to work.

Applying Material—1. Pour the material from the bowl with the aid of the spatula over all the surfaces of the face (Fig. 2).

1. ***One large size drinking straw is inserted in each nostril.***

2. ***Pour the alginate mix over all the surfaces of the face.***

2. Avoid trapping air and place the material carefully around the straws to be sure the patient can breathe adequately.

3. After the alginate covering is complete, mix about the same amount of fast-setting plaster and cover the entire area to reinforce and stiffen the alginate.

4. After the plaster has hardened, remove the entire mask and pour in the plaster (Fig. 3).

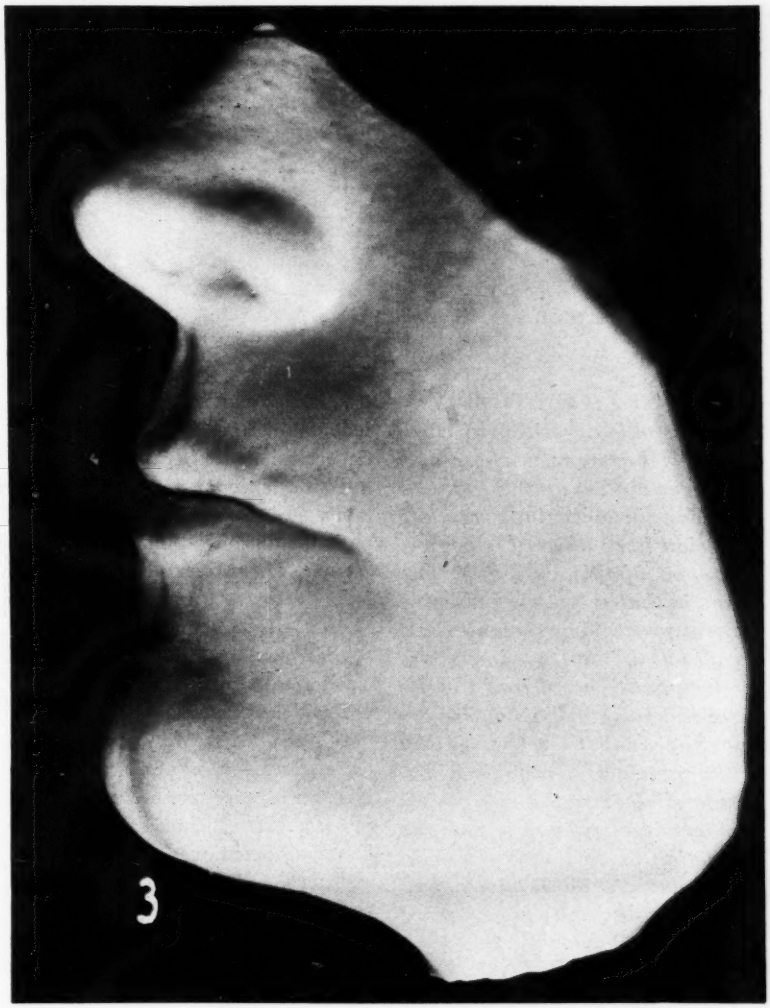
Model Preserves Valuable Measurements

It is desirable to have the patient keep the model of the face rather than to store it in the office. In a few months or years when alveolar processes resorb and facial characteristics change, measurements can be made from the face model and direct comparisons made to restore to the original contours.

Results of Lateral Resorption—Alveolar process resorbs not only vertically, closing the bite, but also laterally so that dentures actually rest distally to their original set-up resulting in collapsed lips.

Restorations of Facial Contours—A trend in setting teeth anteriorly to the ridge for improved esthetics may be enhanced by the use of face models as a guide in accurately restoring facial contours instead of merely replacing teeth.

Glenwood Springs



3. ***After the plaster has hardened, remove the entire mask and pour in plaster.***

Dietary Differences Among School Children

ERCEL S. EPPRIGHT, Ph.D.

Marked differences in food habits may be expected between younger and older children. A better understanding of the variations among the diets of school children is important to nutrition education.

Foundations for Later Nutritional Adaptations

Learning to adapt the food intake to changing conditions during the school age may lay the foundation for adaptations needed in later years. This discussion is based on a statewide study of the nutrition of Iowa public school children.

Dietary Records Kept

Under the supervision of a qualified dietitian seven-day dietary records were kept by the children or their mothers. Mean daily intakes of food energy and 10 nutrients were estimated from the records for the children at successive years from six through 18. The distribution of calories among food groups, and of nutrients among meals and snacks was calculated. The boys and girls will be considered in four age groups as follows: 6, 7, 8-year-olds; 9, 10, 11-year-olds; 12, 13, 14-year-olds; 15 years and older.

Summary

As Iowa children advanced in school, the percentage with excellent diets decreased. The frequencies of dietary inadequacies particularly in calcium and ascorbic acid increased from the early to the late school years. Some differences among the age groups in use of foods were noted. The most striking was that teen-age girls used less milk and eggs than girls of six, seven, and eight, and concurrently the use of desserts almost doubled.

With the girls the percentage of calories obtained at breakfasts de-

(*Continued on page* 520)

TRAUMATIC OCCLUSION:

the General Practitioner's Responsibility

RICHARD W. KELLER, D.D.S., Chapel Hill, North Carolina

DIGEST

The contradictory views of clinical and laboratory workers and the uncertainties due to the lack of evidence concerning traumatic occlusion have affected adversely treatment of this condition. The result is that a large number of general practitioners are neglecting all but the most obvious cases of traumatic occlusion in the natural dentition. This article defines the dentist's responsibility in the matter of traumatic occlusion and documents completely the terminology used, and the evaluation of normal centric and centric dysfunction. The problem of mounting and transferring casts is described.

Opinions Expressed in Dental Literature

There is no common agreement as to what effect traumatic occlusion has on the dental apparatus. Histopathic studies on human jaws from autopsy material have proved that occlusal trauma is a definite cause of certain pathologic disturbances in the periodontium.[1, 2] The evidence was the presence of abrasion, cemental tears, root and alveolar bone resorption, periodontal membrane injuries, and fracture of teeth. The following are some of the opinions on this subject that have been published by several authorities:

Noninfectious Injury the Result of Traumatic Occlusion—Stillman[3] was among the first to call attention to traumatic occlusion as a cause of periodontal disease. He claimed traumatic occlusion directly produced noninfectious injury; and that once established it resulted in irritation and periodontal congestion.

Bone Resorption and Widened Periodontal Spaces from Traumatic Occlusion—Gottlieb and Orban[4] in their studies on dogs found traumatic occlusion to produce bone resorption and widened periodontal spaces.

Alinement Altered by Excessive Occlusal Stress—Box[5] performed experiments with excessive occlusal stresses in sheep. He concluded that this type of stress, if continued, tended to move teeth out of line.

Imbalance of Muscle Forces Cause of Injury—Gratzinger[6] wrote that the injury to the periodontal tissues was not of a traumatic nature, and it was not caused by a certain type of occlusion. He believed imbalance of related muscle forces to be the cause of the evident injury.

Possible Amount of Stress to be Withstood Undetermined—MacMillan[7] expressed disagreement that traumatic occlusion is the main force in causing periodontal disease. He reasoned that the maximum amount of stress the periodontium can withstand without injury has never been determined. Further, the taking of teeth out of occlusion has not prevented or cured periodontal disease.

Resorption Produced by Constant Pressure—Leriche and Policard[8] stated that constant pressure on bone produces resorption, while intermittent pressure favors bone formation.

Resorption Affected by Resistance of Patient—Kronfeld[9] claimed that resistance of the patient determined the amount of resorption that would result. It was his opinion that even slight occlusal trauma produced grave injury in those persons with low resistance, and that persons with a high resistance withstood great trauma without resorption.

Psychosomatic Factors in Trauma—Dummett[10] expressed the opinion that psychosomatic dentistry may and probably does have some positive contributions to make to the subject of traumatism.

Evaluation of Occlusal Trauma as a Factor in Periodontal Disease—The Evaluating Committee I[11] for the Periodontal Workshop concluded: "Occlusal trauma causes definite changes in the supporting structure." The Evaluating Committee II[12] for the Periodontal Workshop concluded: "Although the literature presents conflicting statements about the role of occlusal trauma, a considerable preponderance of evidence supports the conclusion that occlusal trauma should be accepted as a factor in periodontal disease."

Responsibility to the Patient

It is evident from the literature that traumatic occlusion is a potential destructive force which warrants the conclusion that the dentist does

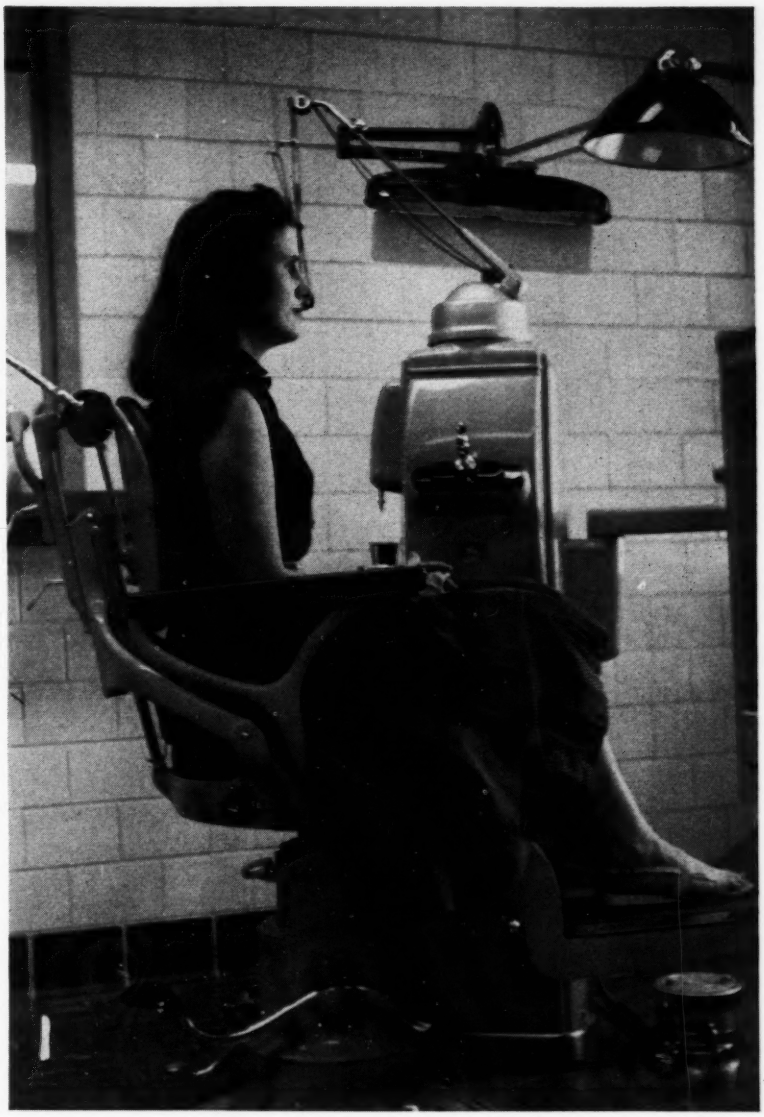
[1] Gottlieb, B., and Orban.: Experimental Traumatic Occlusion, Leipzig, G. Thieme, 1931.
[2] Oppenheim, A.: Tissue Changes Particularly of the Bone, Incident to Tooth Movement, Am. J. Orthodont. **3**:57 (Oct.) 1911; **3**:113 (Jan.) 1912.
[3] Stillman, P. R.: The Management of Pyorrhea, D. Cosmos **59**:405 (April) 1917.
[4] Gottlieb, B., and Orban, B.: Biology and Pathology of the Tooth and its Supporting Mechanism, New York, MacMillan Company, 1938, pp. 58-105.
[5] Box, H. K.: Traumatic Occlusion and Traumatogenic Occlusion, Oral Health **20**:642 (June) 1930.
[6] Gratzinger, Max: Dynamic Irritation as a Cause of Periodontal Disease and the Means for its Elimination, JADA **37**:294 (Sept.) 1948.
[7] MacMillan, H. W.: The Case Against Traumatic Occlusion, JADA **71**:1996 (Nov.) 1930.
[8] Leriche, R., and Policard, A.: The Normal and Pathological Physiology of Bone, St. Louis, C. V. Mosby Company, 1928, p. 99.
[9] Kronfield, R.: Histopathology of the Teeth and Their Surrounding Structures, ed. 3, Philadelphia, Lea & Febiger, 1949.
[10] Dummett, O. D.: Traumatism and Atrophy: Etiology, Pathology and Symptomatology, JADA **44**:717 (June) 1952.
[11] Periodontal Workshop—Evaluating Committee I.: Report, JADA **45**:9 (July) 1952.

have a serious obligation to his patients with reference to this condition. He must be able, therefore, to recognize and evaluate occlusion problems, if any are present, in his patients.

Reasonable Fee Justified—The dentist is entitled to a just fee for the time he spends in evaluating the occlusion. Explanation of the importance of evaluating occlusion will convince most patients that the necessary fee is merited. Few patients will object to paying for a thorough diagnostic service if they are aware of its importance. Or an addition may be made to the cost of other treatments to cover the time spent in diagnostic procedures.

Correction of Traumatic Occlusion—In some cases treatment calls for knowledge and skill not resonably expected of the general practitioner. The obligation to his patients is satisfied if he can inform them of the existing condition and its dangers and if he is able to refer them to someone who can render treatment. Once aware of the nature of the condition and what should be done, the responsibility rests with the patient.

Adequate Knowledge and Skill Required—Attempting the correction of traumatic cases without possessing the required knowledge and skill involves a moral obligation and perhaps a legal liability. More than a few mouths have suffered worse damage from the treatment than the disease.



1. ***Patient position for evaluating occlusion.***

Terminology Used in Evaluation

Sicher[13] has established the following definitions:

"*Rest Position* of the mandible is that position that the mandible assumes when the mandibular musculature relaxes to tonic contraction, that is, when the body is in upright standing or sitting posture; any movement of the head, or neck from the upright position forces the mandible out of its rest position. In rest the mandible drops slightly, the incisor teeth are separated by a distance of two to five millimeters, the lips are lightly closed. Since muscle tonus under normal and comparable conditions is fairly constant for each person, the rest position is equally a fairly constant position of the mandible.

"*Occlusal Positions* are all positions of the mandible in which teeth are in contact. The median occlusal position can be differentiated from the right and left lateral and retrusive occlusal positions.

"*Centric Position* is the physiologic balanced position of the mandible in which not only the teeth are in normal relation but also the temporomandibular joints and mandibular musculature are in harmony. It is, therefore, the ideal position of the mandible and should, in a normal dentition, coincide with the median occlusal position.

"*Freeway Space* is the interocclusal clearance ranging in the normal dentition from two to five millimeters when the mandible is in the rest position."

Evaluation for Normal Centric

A patient will have a normal centric when he can close from the rest

[12] Periodontal Workshop—Evaluating Committee II: Report, JADA **45**:17-18 (July) 1952.
[13] Sicher, Harry: Positions and Movements of the Mandible, JADA **48**:620 (June) 1954.

2. *Rest position with lips retracted.*

3. *Position of teeth at first contact.*

4. *Final closure. Shift of the mandible is evident.*

position through a normal range freeway space to the median occlusal position without a mandibular displacement. In most cases the following measures will determine whether a patient can accomplish this procedure:

1. With the patient in an upright position (Fig. 1) have him swallow several times or swallow and wet the lips with the tongue, and at the completion of these movements have him hold the position his mandible has taken (Fig. 1).

2. With a little practice it is possible to have the patient perform these movements and at the same time allow the operator to part the lips to examine the existent space without the patient altering this rest position (Fig. 2).

3. From the rest position have the patient close until he feels the first contact of his teeth and stop (Fig 3). Note if he passes through a normal range of space.

4. Have the patient close from first contact to full contact. Notice if in final closure there is a shift of the mandible to reach the median occlusal position (Fig. 4). If (1) there exists a less or greater than average freeway space, or (2) a shift is noticeable in coming from first contact to final closure to the median occlusal position, then a traumatic occlusion is present in centric.

Summary of Centric Dysfunction

It is generally agreed that it is not possible to have a normal nontraumatic condition in the eccentric positions unless there exists first a normal centric. It is not the purpose here to discuss the ways and means to correct traumatic conditions.

Classification and Treatment—The following summary of classification and treatment of occlusal dysfunction, by Thomas and Gallagher[14] as it relates to the normal centric seems appropriate:

1. Condyle displaced from the normal position because of premature contacts or abnormal position-

[14]Thomas, B. O. A., and Gallagher, J. W.: Practical Management of Occlusal Dysfunction in Periodontal Therapy, JADA **46**:21 (Jan.) 1953.

ing of teeth. Corrective measures are the following:

(a) Bite splint, to allow repositioning of the mandible to normal relationship.

(b) Orthodontic movement of teeth.

(c) Occlusal reconstruction procedures.

(d) Selective grinding. This is only indicated where the displacement is of a minor degree and requires the use of mounted casts when the premature contact areas cannot be determined otherwise.

2. Premature contact of posterior teeth in centric relation; corrected by selective grinding. When this condition exists, accurately mounted casts may be required to view satisfactorily the relation of cusps to fossa in centric position and in lateral excursion.

3. Premature contact of anterior teeth in centric relation. Corrected by selective grinding which can be done readily without resorting to mounted casts. Accurate information can be gained from the use of bite waxes and articulating papers.

Technique of Grinding—The most difficult phase in the treatment of this problem is the technique of grinding the teeth. This subject is accurately and clearly explained by Schuyler.[15] Understanding and mastering the principles, he proposes, will allow the average operator to carry out this phase of treatment without difficulty.

5. *Softened wax trimmed and seated in median occlusal position.*

6. *Registering the working bite.*

Evaluation for Normal Eccentric

After it is determined that a normal centric is present or an abnormal centric has been corrected, check for normal eccentric positions. Thompson[16] suggested the following technique which is satisfactory for the majority of patients:

1. Soften a piece of low fusing baseplate wax in warm water and fold it on itself to a double thickness. Trim to extend a little beyond the buccal and incisal positions of the teeth.

2. Place the softened wax on the upper teeth and have the patient close into the median occlusal position to seat the wax (Fig. 5).

3. The patient is instructed to move the mandible slightly into right and left lateral positions. This may not exactly duplicate the masticating stroke as it is proceeding in the opposite direction, but in most instances it is sufficient.

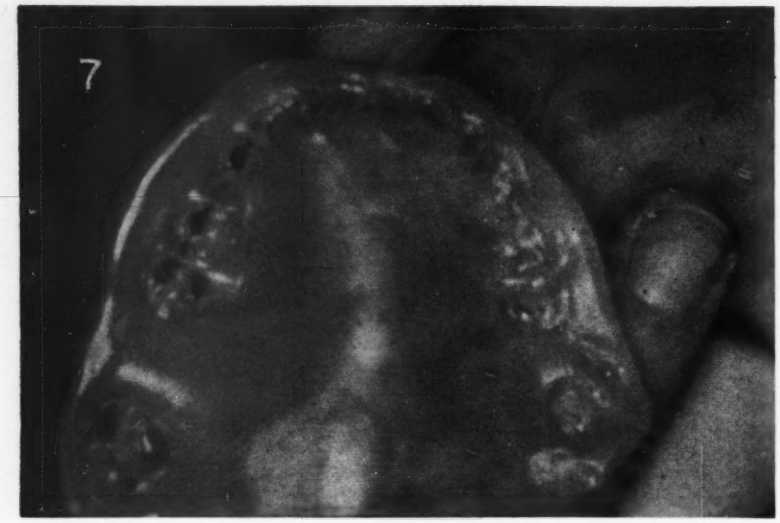
Eliminating Interferences Ultimate Goal—Areas of premature contact will perforate the wax and the areas of perforation on the balancing side can be differentiated easily from like areas on the working side (Figs. 6 and 7). The ultimate goal is to eliminate interference present in the functioning range of the person.

Modification of Functional Range Range—As interferences are relieved, functional range will be modified within the limits of the neuromuscular adaptability for the improvement of the patient's total dental apparatus.

Use of Articulation Papers—When the wax presents a uniform pattern

[15]Schuyler, C. H.: Fundamental Principles in the Correction of Occlusal Disharmony, Natural and Artificial, JADA **22**:1193 (July) 1935.

[16]Thompson, J. R.: Concepts Regarding Function of the Stomatognathic System, JADA **28**:634 (June) 1954.



7. ***Wax perforations on the working side are differentiated easily from the balancing side.***

8. ***Casts positioned in wax bite registered at first contact.***

without perforations, proceed to the use of articulating papers. A scientific approach is to hold a section of the paper with cotton pliers so that the beaks are at the mesiobuccal cusp of the upper first molar. This enables the operator to orient the perforations from the pliers' relation to the first molar. Perforations are seen as a circle, rather than a solid mark. The paper is perforated by the contacting tooth surfaces which erase that part of the carbon mark.

Areas of Interference Removed—Using the principles proposed by Schuyler, these areas of interference are removed until the mandibular movements are free and easy and the teeth to the operator's tactile sense are felt to have no excessive movement.

Protrusive Occlusal Position—According to Thomas and Gallagher[17], in anterior teeth a distribution of stress over several teeth is desirable when possible. It is not essential to have balance or even contact on the posterior teeth when the jaw is in the protrusive position. The posterior teeth should not be relieved unless they are in excessive contact. When open bite exists, the anterior teeth should not be brought into contact by grinding the posterior teeth unless posterior interferences are limited to only a few minor contacts.

[17]Thomas, B. O. A., and Gallagher, J. W.: Practical Management of Occlusal Dysfunction in Periodontal Therapy, JADA **46**:22 (Jan.) 1953.

Transfer and Mounting Of Casts

Although the question of whether mounted casts are necessary to diagnose and treat traumatic occlusion has been debated, they have proved to be valuable. According to Thomas and Gallagher[18] they are not required in all cases. It is the author's opinion, however, that they are valuable to the average practitioner not only in diagnosis but especially in planning treatment. A mistake made on a cast is easily corrected whereas one made on a natural tooth may well mean serious difficulty.

Transferring Hinge Axis Relationships—The main problem of how best to transfer and mount casts relates (1) to the locating of the hinge axis of the mandible, and (2) to the transfer to an articulator so that the casts have the same hinge axis relationship on the instrument as in the mouth. It is apparent that there is no exact method which will accomplish this so-called ideal with ease and consistency. It has not been proved that such a relationship is necessary or even desirable.

Instruments Fulfill Practical Requirements—Schulyer's opinion that the use of a face-bow as advocated by Snow will accomplish at least 90 per cent of the requirements seems justified. Any of the simple instruments such as the Hanau, Gysi, or Swedish Dentatus, if used to the limits of their application, meet practical requirements. Every dentist is familiar with one or more of these techniques which will permit a satisfactory approach to treatment.

[18]Thomas, B. O. A., and Gallagher, J. W.: Practical Management of Occlusal Dysfunction in Periodontal Therapy, JADA, **46**:23-30 (Jan.) 1953.

Knowledge of Tooth Coordination in Function of Value — Schuyler[19] made this further observation, "while the use of an articulating instrument with the greatest adaptability is commendable, the greatest good to the greatest number will result not from the universal adoption of such instruments, but from the more general acquisition of a better understanding of the science dealing with tooth coordination in function."

Taking the Bite in Standard Procedure—In the use of standard transfer procedures referred to, the bite used to orient the casts are taken:

1. Instruct the patient to close from the rest position into the bite wax until he just feels the first tooth contact (Fig. 8).

2. Have him repeat this procedure several times before taking the final bite. This will position the casts so that the instrument passes through the smallest distance in bringing the casts to the final contact.

3. The closure from rest position to first contact will be recorded in a pure hinge movement which is a definite aid in using the standard transfer procedures. It simplifies relation of casts on a standard instrument to produce a satisfactory relation which is similar to the position of articulation in the mouth.

[19]Schuyler, C. H.: Factors of Occlusion Applicable to Restorative Dentistry, J. Pros. Dent. 3:770 (Nov.) 1953.

Summary and Conclusion

Dentists are responsible for the oral health of their patients and must therefore be aware of the need for the evaluation of occlusion.

Clarification of terms relating to occlusion and a simple technique for evaluation of normal centric and eccentric positions are given.

The general practitioner has adequate knowledge and armamentaria for discharging his responsibility.

University of North Carolina School of Dentistry

MEDICINE and the Biologic Sciences

Arthritis—Treatment

Treatment for arthritis should be started at the onset and continued uninterruptedly throughout the active course. Many uncomplicated measures may prevent deformity and preserve musculoskeletal function.

The most common cause of crippling with rheumatoid arthritis arises from lesions of the knee joint. With early slight involvement, the joint is only a little deformed. The signs and symptoms are those of any irritation of the synovia of the knee. These include (1) soreness when beginning to walk after prolonged rest, on full motions, or after extensive use, (2) fatigue of the musculature of the thigh and leg, (3) muscular atrophy, (4) swelling of the knee, and (5) slight limitation of active and passive motion.

No matter how slight the inflammation, complete rest is necessary, Usually a cast is applied for one to two weeks with the knee at the limit of extension. Crutches are used to eliminate all weight-bearing.

Corrective exercises are started since weight-bearing cannot be resumed until the patient can hold the knee in a functional position of full extension by active muscle power. When full extension is attained, passive resistance exercises are added to strengthen extensor muscles.

After full range of motion has been attained, the patient begins to test the knee by use. A cane is carried in the opposite hand for all weight-bearing and every step is carefully considered to ensure relatively atraumatic function. When progress is made without recurrence of the disability, activity is increased.

This basic treatment program of (1) rest, (2) prevention of deformity, and (3) active and passive exercises may be modified according to variations in the condition and progress. If the knee is acutely inflamed, immobilization is stressed. If the knee is permanently contracted in a deformed posture, restoration of passive extension is most important.

Surgical treatment is used in old and severe deformities. The end results have greatly improved with the use of cortisone and ACTH. Inflammation is controlled, postoperative scar formation and edema are inhibited, and postoperative pain is less severe than formerly.

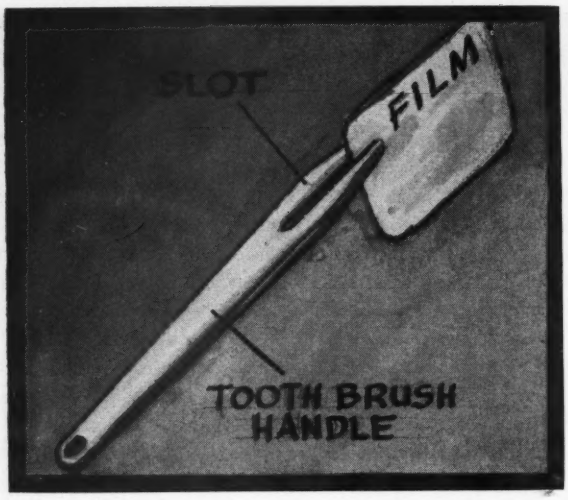
Preston, Robert L.: Musculo-Skeletal Function in Rheumatoid Arthritis, Maryland M. J. **3**:112-122 (April) 1954.

Water Intoxication

Healthy persons can drink large amounts of water safely. Sick persons, however, may not excrete an excess of water. If the water is given without electrolytes, the retained liquid dilutes the body fluids and lowers the osmotic pressure. The resulting hypotonicity provokes symptoms of disordered cerebral function.

Water intoxication is associated with low plasma-sodium concentration. This is also found in cases of sodium depletion or symptomless hypotonicity. These three symptoms

(*Continued on page* 506)



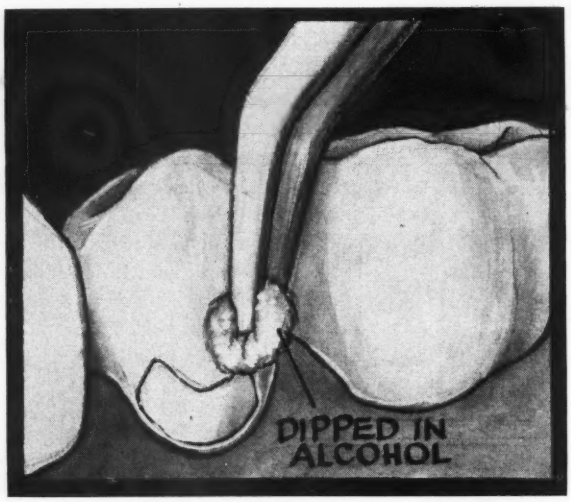
1

Clinical and Laborator

An X-Ray Film Holder

Ben E. Pleshette, D.D.S., New York

1. Cut off the handle from a plastic toothbrush. Make a slit at one end about 1¼ inch long. Insert the film in this slot. Place in the mouth at the site to be x-rayed. Have the patient close his jaw on the handle. This is especially useful in lower third molar areas.

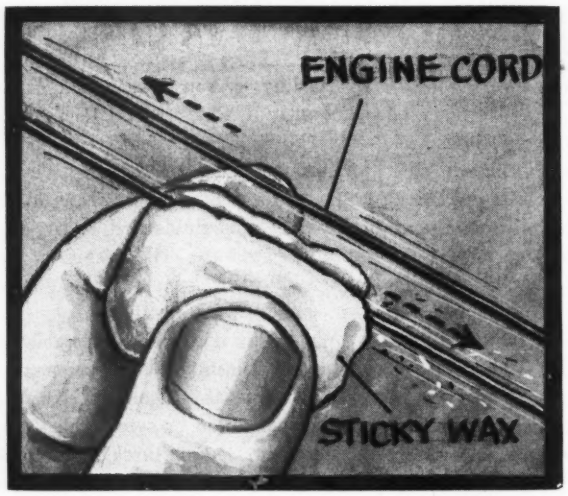


2

Finishing an Amalgam

William L. Peecook, D.D.S., Hartsdale, New York

2. After rough carving of an amalgam restoration, wipe it gently with a cotton pellet dipped in alcohol. This leaves a smooth semi-polished surface and removes the small flash of amalgam extending over the margins.



3

Preventing Engine Cord Slipping

Sidney R. Winett, D.D.S., Westfield, New Jersey

3. When mounting a new engine cord, run it through a cake of sticky wax until the cord sinks to its depth. The wax on the cord increases the traction.

READERS *are Urged to Collect $10.00*

For every practical clinical or laboratory suggestion that is usable, DENTAL DIGEST will pay $10.00 on publication.

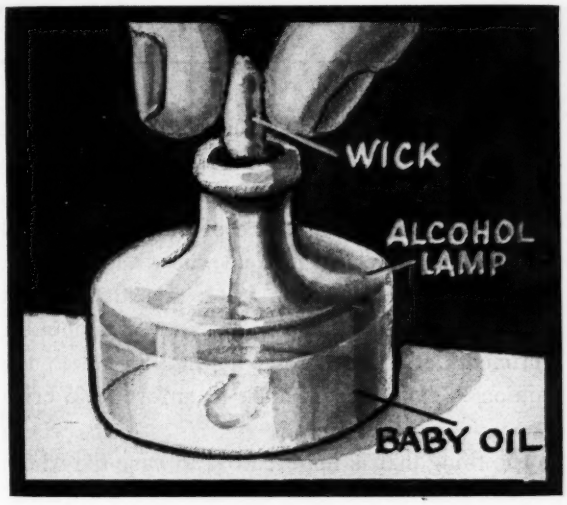
You do not have to write an article. Furnish us with rough drawings or sketches, from which we will make suitable illustrations; write a brief description of the

SUGGESTIONS . . .

How to Prevent Materials from Sticking to the Fingers

Arthur A. Greene, D.D.S., Canton, Ohio

4. To keep modeling compound, temporary stopping, or inlay wax from sticking to the fingers, touch the wick of an alcohol lamp which has been filled with baby oil.

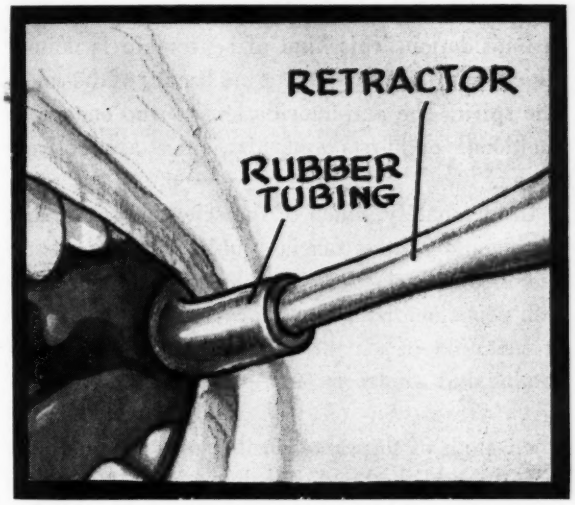


4

A Comfortable Retractor

Elsie A. Richards, Denver, Colorado

5. To afford more comfort to the patient during surgical procedures a small piece of rubber tubing is inserted over the flat surface of the retractor. This rubber tubing protects the patient's lip from injury.

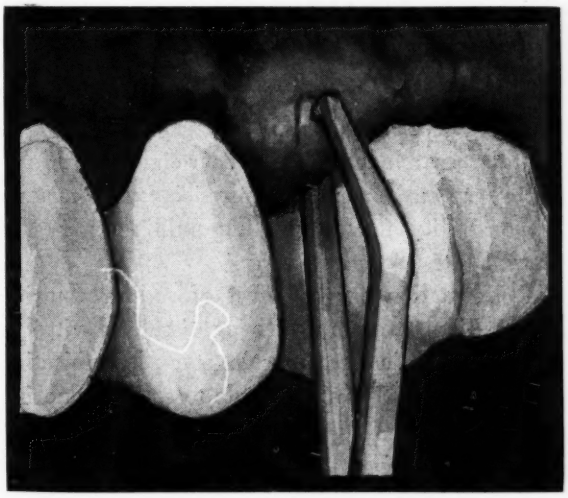


5

Gingival Pocket Marker

Eugene A. Leatherman, D.D.S., Lake Charles, Iowa

6. Bend one tip of a pair of cotton pliers at right angles to the shaft. The bent tip should be 1½ millimeters long. Reduce the remaining straight shaft to a length equal to the bent shaft. To use the instrument insert the straight shaft to the depth of the pocket and squeeze the pliers. The right angle tip penetrates the soft tissues and marks the depth of the pocket by producing a bleeding point.



6

technique involved; and jot down the advantages of the technique. This shouldn't take ten minutes of your time. Turn to page 513 for a convenient form to use.

Send your ideas to Clinical and Laboratory Suggestions Editor, DENTAL DIGEST, 708 Church Street, Evanston, Illinois.

The EDITOR'S *Page*

ONE OF the forms of criticism directed against anyone who questions the overall biologic effects of fluoridation is to have his utterances labelled as unscientific. This is a device of pinning the label of cultist or quack on anyone who disagrees with the present enthusiasm for water fluoridation. Not only is the person who expresses these unpopular sentiments attacked but the journal in which the opinion is expressed is open to unfavorable criticism.

The thing that is important is to have the whole truth of fluoridation revealed. The profluoridationists will not reach the goal of truth by denying the right or free expression to responsible people who are fearful of some of the biologic dangers inherent in fluoridation. This kind of censorship is neither ethical nor does it represent the beauty of the scientific spirit. The anti-fluoridationists who engage in emotional outbursts and histrionics are entirely wrong.

Unfortunately, much of the scientific press, and that includes most official publications of dental and medical societies, have been more concerned with propagandizing for fluoridation than with the presentation of all the scientific facts. There are notable and wholesome exceptions. *The Journal of Dental Research* is one; *Chemical Abstracts* is another. Both of these responsible publications have recently published material that suggests that there may be general biologic implications to fluoridation that we must consider for the overall health and welfare of our people.

Nicholas G. Grand[1] of the Department of Pathology, School of Dentistry, St. Louis University, working under a research grant of the U. S. Public Health Service, has published a paper on basic dental research that should be weighed carefully by every dentist and every physician who has any responsibility for fluoridating public water supplies. Doctor Grand writes:

"Information on the effect of sodium fluoride and sodium oxalate on living tissue in vitro is meager. Loeb induced muscle tetany by subjecting exposed frog nerve and muscle to sodium fluoride and sodium oxalate. The tissue culture experiments of Paff and Boyd show that sodium fluoride inhibits tissue growth of growing chick embryo bone at a concentration of 1:200M (5.0 meq. per liter of F-, or 210 ppm NaF) but has no effect at a concentration of 1:500M NaF (2.0 meq. per liter of F- or 84 ppm NaF). Sodium fluoride decreases the rate of rachitic cartilage calcification in vitro, and when magnesium is added, such inhibitory effects progress beyond the initial stage . . . Our approach to an interpretation of these experimental results has been entirely on the hypothesis that fluoride inhibits calcium in tissues, rather than on any action of fluoride on specific enzymes or enzyme systems."

The important point in this report of Grand's is that he is considering the fluoride ion in its effect on the total organism: in this case the heart and kidney tissue of the chick embryo.

In a report in *Chemical Abstracts*[2] several Japanese medical research workers have shown that severe myocardial damage has been observed in white rabbits and rats given high doses of fluoride. The abstract reads:

"Histologically, regressive degeneration, infiltration of cells, hyperemia, hemorrhages, and thickening of vessel walls were observed in the heart muscle . . . The group [of rats] given a food containing 50 ppm showed severe myocardial changes in one month, while the group receiving 5 to 10 ppm showed some histologic changes in two to three months."

If the fluoride ion has an affinity for calcium it is quite possible that the finely balanced physiologic mechanisms in which calcium plays an important part may be disturbed. The physiology of muscle, of nerve conduction, of bone, of blood, are all dependent on proper calcium balance.

In both the experiments of Grand and the Japanese scientists the concentration of sodium fluoride was many times greater than that recommended for communal water supplies. The point is that even in low doses of 1 ppm there *may* be cumulative damage to vital tissues that only in *vivo* controlled experiments will reveal.

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[1]Grand, Nicholas G.: The Effect of Sodium Fluoride and Sodium Oxalate on the Chick Embryo Heart and Kidney in Tissue Culture, J. Dent. Res. **34**:341-348 (June) 1955.

[2]Kono, Kunimitsu, et al.: Changes of the Heart of Growing Albino Rats Fed on Varied Contents of Fluorine, Chemical Abstracts **49**: No. 8, 5647 (April 25) 1955.

(*Continued from page* 501)
comprise the hypotonic syndromes.

Peristent and resistant low plasma-sodium concentrations may be found in chronically ill patients. It is termed symptomless hypotonicity. The condition is distinguished from both true sodium depletion and sodium dilution by chronicity and by the failure of added salt or of water restriction to correct the disorder. The cause is unknown and the condition resists treatment.

The sodium depletion syndrome is due to large losses of sodium. It is associated with (1) dehydration, (2) hemoconcentration, (3) hypotension, and (4) urea retention.

Water intoxication may complicate any illness when free intake of water is associated with reduced excretion, as with some forms of cardiac, hepatic, or renal insufficiency and with prolonged anemia. Most acute cases, however, appear in the immediate postoperative period of patients without persistent oliguria or without any other evidence of renal failure.

Surgical patients are especially vulnerable to water intoxication because of the use of parenteral fluids and the disturbance of renal function after trauma. Anuria or oliguria usually occurs for twelve to thirty-six hours postoperatively. It is attributed to excessive secretion of antidiuretic hormone. Postoperative water intoxication appears most commonly in the same period and is due to error in fluid therapy.

Water by rectum is a prominent cause of water intoxication. Some intoxication may occur even when patients take oral fluids under voluntary control. Patients may have severe body fluid dilution and still be thirsty.

Symptoms of acute water intoxication may start dramatically and are usually cerebral at first. Weight is not lost but gained and the patient lacks the haggard appearance of dehydration. Treatment consists of restriction of water intake and infusion of hypertonic saline which is safe and effective for severe cases.

Wynn, Victor, and Rob, C. G.: Water Intoxication, Lanset **266**:587-594 (April) 1954.

Diabetes in Pregnancy

In women with a diabetic trait or with a latent weakness of insulin production, pregnancies disturb the regulation of the carbohydrate metabolism. This is evidenced by the hyperglycemic tolerance curve. This curve does not become abnormal until after the fourth month of pregnancy, and there may be no glycosuria. This disturbance in regulation disappears or diminishes after delivery.

The consequences to the fetus are serious. The fetal loss rate increases from 20 to 50 per cent in proportion to the increasing severity of the disordered glucose metabolism. A large number of the infants who are born alive have an excessive weight.

The hyperglycemic or prediabetic dysfunction provokes hyperplasia of the islands in infants born of diabetic mothers. The tendency to obesity, hyperglycemia, and finally diabetes that

(*Continued on page* 510)

(*Continued from page* 506)

characterizes the ultimate development of a great number of these infants are the consequences of heredity, on the one hand, and maternal environment, on the other hand.

The correction of these disturbances of carbohydrate metabolism by insulin reduces the fetal loss rate and the infant mortality. By normalizing the maternal environment, the hyperplasia of the islands will be reduced. It is believed that by correcting the transitory hyperglycemia of pregnancy by means of insulin, the newborn of so-called prediabetic mothers will not only survive but will have normal growth and development.

In order to recognize prediabetic mothers, it is necessary to perform sugar tolerance tests in each trimester of pregnancy. The correction of the hyperglycemia of pregnancy by insulin may prevent the appearance of diabetes in the mother and the anatomic and functional anomalies due to diabetic embryopathy in the infant.

Hoet, J. P.: Carbohydrate Metabolism During Pregnancy. Diabetes 3:1-12 (*Jan.-Feb.*) 1954.

Leukemia

Leukemia is increasing, not only in diagnosis but in actuality. The most common form of the disease is lymphocytic leukemia. It is ordinarily found in the old age groups. The relative benign chronic cases are about twice as frequent as acute cases.

Acute leukemia occurs at any age, but most of the cases in childhood are of the lymphocytic type. Acute granulocytic leukemia occurs about equally in almost every age group. This includes the myelomonocytic form in which a large number of circulating white blood cells are monocytic. Pure monocytic leukemia is unusual, occurring in about five per cent of acute cases.

Myelotoxic agents may eventually lead to abnormal leukemia proliferation. These include roentgen therapy and chemicals, if producing sufficient

destruction. Viruses may result in leukemia either by viral activities or through such activators as roentgenograms and chemicals. These viruses may be transmitted from a parent to offspring and lie dormant for years.

Roentgen therapy is the standard therapy for acute disease. Acute leukemia is aggravated, however, by such treatment and continued therapy of chronic cases is inadequate. Furthermore, roentgen ray therapy is non-specific and requires expensive equipment and the services of highly skilled specialists. Radioactive isotopes are also of no value for acute leukemia. They are beneficial only for the chronic forms of granulocytic leukemia.

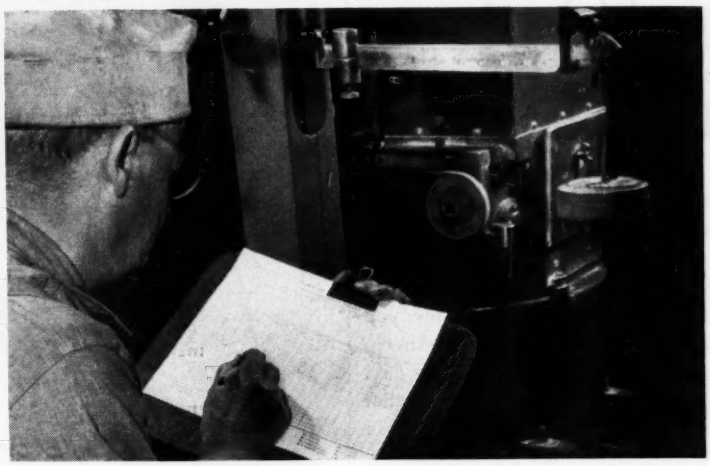
Nitrogen mustard is of no value for leukemia. It is beneficial for Hodgkin's disease and some cases of generalized lymphosarcomatosis. Urethan is helpful in maintaining the remission of chronic granulocytic leukemia induced by roentgen rays and in the therapy of multiple myeloma.

For acute leukemias, mostly lymphocytic, of childhood and early adulthood, aminopterin is particularly useful. Within one to six weeks complete remissions appear and then can be maintained four weeks to two years in approximately 50 per cent of these patients. For adults over 30 years of age, aminopterin is of questionable value and toxic effects may be severe.

ACTH and cortisone also produce remission in at least 50 per cent of cases in childhood. The improvement is short lived and relapses are difficult to treat.

Dameshek, William: The Outlook for the Eventual Control of Leukemia, New England M. J. **250**:131-139.

In your ORAL HYGIENE this month



How Fluorides Are Added to the Community Water Supply

A series of pictures shows the machinery and method by which fluorides are added to a community water supply. Accuracy of measurement is assured by careful weighing and automatic feeding. The proportion of additive is checked and re-checked by hourly inspection and frequent sampling.

★ ★ ★

"Let's Practice Oral Medicine," suggests Doctor J. H. Van Ness. The dentist should be able to detect many systemic disturbances at an early stage in their development. He should be able to recognize and refer to the physician, cases of jaundice, syphilis, leukemia, and scarlet fever. Of course he should be able to recognize and treat, capably and confidently, those diseases which are strictly oral in character.

★ ★ ★

When tempted to let down a bit and relax rigid professional standards, remember that you are continually "on trial." As Doctor F. G. Robeson reminds us, "Court is in session all day long, and 'The Patient Is the Judge and the Jury.' "

Are you a victim of "desklitteritis?" Many dentists are. Experts in office management insist that the orderliness of a desk top reflects the systematic thinking of the worker behind it. M. Travascio tells the dentist how to avoid clutter and arrange his desk efficiently.

★ ★ ★

If you have an assistant whom you can trust, you are fortunate. Petty thievery is becoming increasingly common both in the professional office and the business establishment. Vivian G. Taylor suggests ways in which the dentist can prevent possible losses.

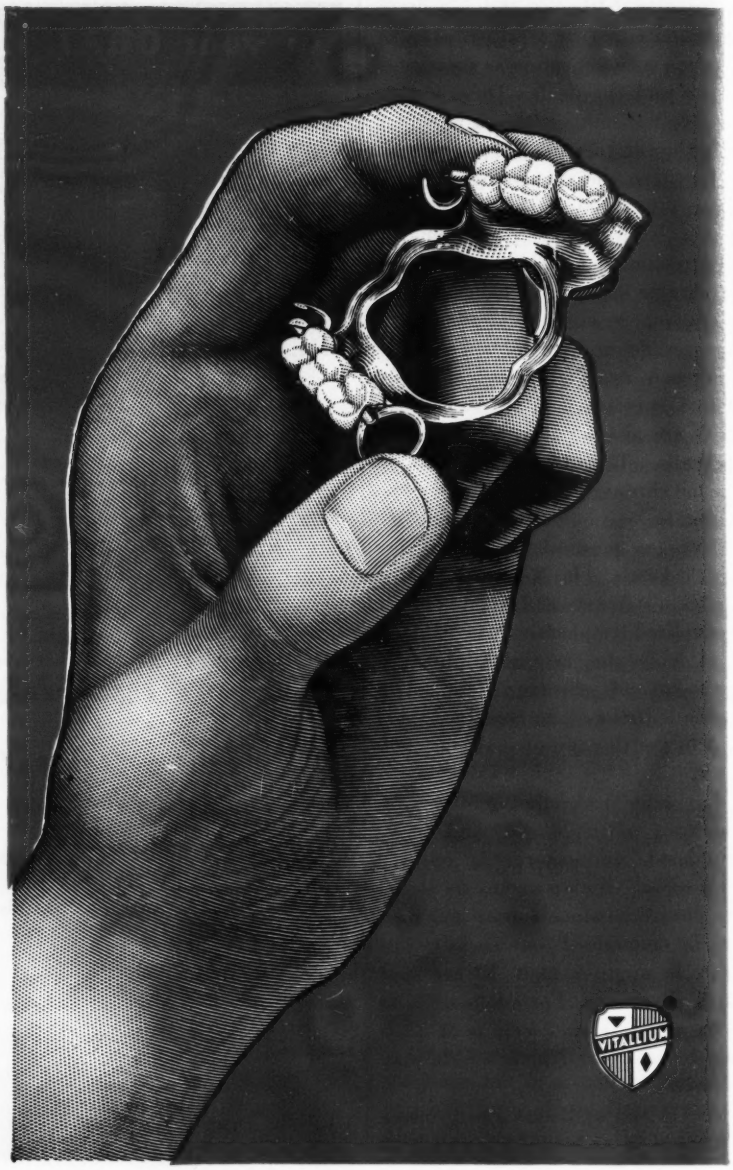
★ ★ ★

"Sweden Has New Health Plan"—This article outlines the method by which employee, employer, and state, share the cost of medical, dental, and hospital care under a plan which has been in effect since January.

★ ★ ★

Wilbur discusses dental assistants this month, as author Robert P. Stickley records the seventh of a series of eight imaginary conversations on practice management.

Contra-Angles



The Dentist Prepares For Women

We have been neglecting our old friend and mentor, Doctor Hambly, for the past few months. Hambly, you will recall, was the Emily Post-Angelo Patri of the dental world of his day. He was the arbiter of all things that were true, proper, and virtuous in dentistry at the turn of the century.

I have no direct information from his contemporaries that would give a clue to what sort of fellow Hambly was. I would gather from his writings that he was on the stuffy side and well inflated with self-righteousness. His tirades against the evils of drink and tobacco would cast him on the side of the reformers. The jaundiced eye that he turned toward womankind would make me think him to be a panty-waist.

Of one thing we can be reasonably sure: Hambly was not overly endowed with a sense of humor. Nor did he write on occasion with tongue in cheek. When he gave advice to the dentists of his day on the subject of marriage, for example, he was deadly serious and deadly dull. It may be hard for us to believe that the book, *The Practice Builder*, went into several printings. This is an unusual experience for any book today, even a good one, so Hambly must have had a loyal following among dentist readers in the early days of the century.

It was in these sterling words, somewhat trite to be sure, that Hambly advised his colleagues on the dread and sombre realities of matrimony:

"If there is one thing that will make a woman love a man, it is liberality; not prodigality, but just liberality, within reasonable limits, that is bounded by an appreciation of his income. Liberality will cover a multitude of faults. And after all, what can give a man greater happiness than to see his wife enjoying life, to see her happy and sweetly content. Economy is all right, but economy that robs us of present enjoyment is all wrong.

"Economy that keeps people in a continual drizzle saving up for a rainy day is something not altogether to our taste.

"No man should ask a girl to marry him unless he is prepared to keep her in circumstances becoming to her former position, and in conformity with his own dignity as a professional man; no man is warranted in asking a girl to marry him when he has not a large practice, nor when he is in the beginning of his professional career. Leaping headlong into marriage without thinking of the financial side of the question is just as foolish as waiting too late. A young man in doubt cannot do better, however, than to take the girl into his confidence and ask her opinion about

the matter; and a sensible girl probably has an opinion that is worth listening to. And, if she thinks a good deal of the fellow, she will undoubtedly have a way of her own of solving the question, and of telling about it. It is something that cannot be learned from books, and never will be. It is something that individuals must decide for themselves. It is probable that what is written on the subject will have very little bearing on the practical application of the questions which are considered. People have a way of settling all such questions regardless of precedents and of advice. Individual interests are not subject to general opinions, nor to generalities in deduction. If a man thinks he is sure he loves a girl, if he is of a proper age, and if he is financially prepared to take upon himself the responsibilities of married life, and, most of all, the girl is willing, what more is necessary? Nothing but the ceremony. That's enough, isn't it?"

Hambly may not have been a practicing misogynist but his sentiments

CLINICAL AND LABORATORY SUGGESTIONS

(*See pages* 502 *and* 503)

Form to be Used by Contributors
To: Clinical and Laboratory Suggestions Editor

DENTAL DIGEST
708 Church Street
Evanston, Illinois

From: _____

Subject: _____

_____

_____

_____

Explanation of Procedure:

Sketch:

Suggestions submitted cannot be acknowledged or returned.

$10 will be paid on publication for each suggestion that is used.

toward women in general were not overly torrid. He seemed to have an inordinate fear of the temptress that lurked in the bosom (I am sure he would have approved the use of this noninflammatory noun) of every dental assistant. He particularly feared good looks among "lady assistants." In this case Hambly didn't seem quite so sure of himself and his advice because he hides behind the platitude—let every man judge for himself whether he should have a good-looking or ugly assistant. I can't picture a dentist deliberately picking an ugly one.

Poor old Hambly seemed to feel that virtue and ugliness went hand in hand and that pulchritude and promiscuity were the same. What a naive gentleman he must have been! Ugly girls have not been required to build up their defenses against attack so they may be easy victims of lechery among dentists or others of the male population. The good-looking girl that Hambly feared as a dental assistant and as a seductress is usually well practiced in beating off and run-

ning away from the advances of chance acquaintances, friends, utter strangers and employers. She is skilled in defense and is not easily "taken in" on offense.

Here is the example of the evasion on Hambly's part as he tries to write on this important subject:

"A young woman selected for an assistant should be sufficiently well paid to enable her to dress neatly. While she should be neat in appearance, care should be taken that she is not too good looking; an assistant should not be selected because of her good looks. Good-looking assistants in dental offices have caused more or less trouble, from the time of their first employment. We hope we will be excused from any extended discussion of this matter, and trust that every man will govern his selection by good sense and sound judgment."

Who are "They?"

I never come from a large dental convention without having heard a lot about "they." I have never, to this day, met "they." There have been plenty of flesh and blood men that I have met of all ages, all temperaments, all levels of intelligence, but "they" have not been among them.

"They" may be pushing somebody for office or working hard to keep somebody else out of office. "They" may be for or against some measure such as OASI or fluoridation. "They" are phantoms. Only specific living people can oppose or support anything.

"They" is a symbol of authoritarianism. Authoritarianism is the way of the dictator. "They" is a club that is often used to beat people into line, to make them conform. We do not need a society of 100 per cent conformists. We need people who are individualists. We need rebels. We need dissenters. Democracy is a system of checks and balances, of debate, of difference of opinion. It is not democracy when everybody votes "Ja."

One English physician, J. E. R. McDonagh, himself a brilliant dissenter from orthodoxy in medicine, writes:

"Authoritarianism in this country, and even more so in the United States,

has already succeeded in making a mockery of democracy by regarding dissent as an expression of disloyalty, criticism as an unfriendly act, and difference of opinion as a sign of disaffection. It is no wonder that the people are bewildered, perplexed and unhappy. The vicious circle is completed by the fear that is engendered in the breasts of the orthodox, a fear which can apparently be assuaged by the heaping of prizes, medals and honours upon them."

In dental circles I have seen mediocrity honored and capability ignored because the views expressed by the mediocre were orthodox and "safe." And those by the capable man were as yet unaccepted and were too new.

Specifically, I remember Weston Price who was reviled and traduced by his own colleagues in the dental profession because he had the vision to see that there was a relationship between nutrition and dental disease. Weston Price had opposition, strong opposition, from the millers and sugar refiners because he wrote that a "civilization" that refined and adulterated foods represented not progress but regression. "They" tried to deny Weston Price a place on dental society programs. "They" tried to censure his writings. Actually, both these acts were those of men who were too ignorant to follow Price's logic and his arguments.

Those who hide behind "they" are usually petty men who lack the courage to express their own ideas. The honorable opponent expresses his views, the courageous man puts his in writing, the generous man does not distrust the motives of his adversary.

"They" are sinister forces because, like shadows, one cannot attack them. Like shadows they shift and change and are evasive.

A few simple rules may help: Don't believe anything that is ascribed to "they." When "they" are mentioned, ask for names, dates, and places. When you do, you will find no names, indefinite dates, obscure places. "They" can be destroyed by insisting that your informer be specific, be definite, be precise. Forget about "they."

— E. J. R.

Nutrition in Old Age

THE RISING tide of longevity among our population with its accompanying tragedies increases our medical responsibility in relation to senile psychoses. We must understand what goes on and how to correct it. Many of these troubled, tired, devitalized, and mentally confused older people can be aided by someone's making certain they have an adequate diet rich in vitamins and minerals in a suitable, edible form. They should have vitamins and additional medication for coexisting diseases. It must be kept in mind that they cannot be depended on to eat properly or take medication regularly. Detailed application means a hopeful outlook for many of them, and also that many will not have to go to homes for incurables or institutions for the legally insane.

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(*Continued from page* 490)

with a gnathoscope, but it will be infinitely better than perfunctory bridge replacement and will ensure against concentration of eccentric forces in lateral bite relations.

9. Prepare abutments for bridgework or inlays.

10. Take right or left lateral wax bite relation, whichever is indicated, along with centric for the record of occlusion.

11. Have the technician articulate the abutment preparations in centric, remove the opposite bow of the articulator from the one bearing the prepared teeth and replace it with a spare bow on which he should mount the right or left lateral bite. The lateral bite establishes the length for upper pontics, porcelain, or plastic veneers, and lower pontics as well.

(End First installment)

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